Aug. 1928

Electrical Manufacturing

Vol. 2 A Gage Publication No. 2

"We must get them or stop production"---

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A BRANDYWINE Fibre man happened in at the psychological moment. He was accustomed to such manufacturing problems and had his usual answer.

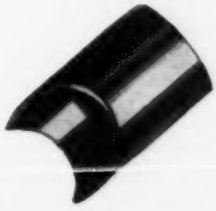
He showed these manufacturers where it was simply a matter of the right gauge fibre tubing fabricated as only BRANDYWINE can *do it*—accuracy plus quantity production on a strictly price basis.

It doesn't matter how large or small the part must be; how intricate in fabrication; how large or small the quantity, BRANDYWINE can handle the order in a most satisfactory and economical manner.

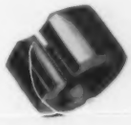
Our sample cabinets are full of the most unusual examples in fibre fabricating using fibre tubing as a basis. Thousands of little parts and each representative of a job that "couldn't be done."

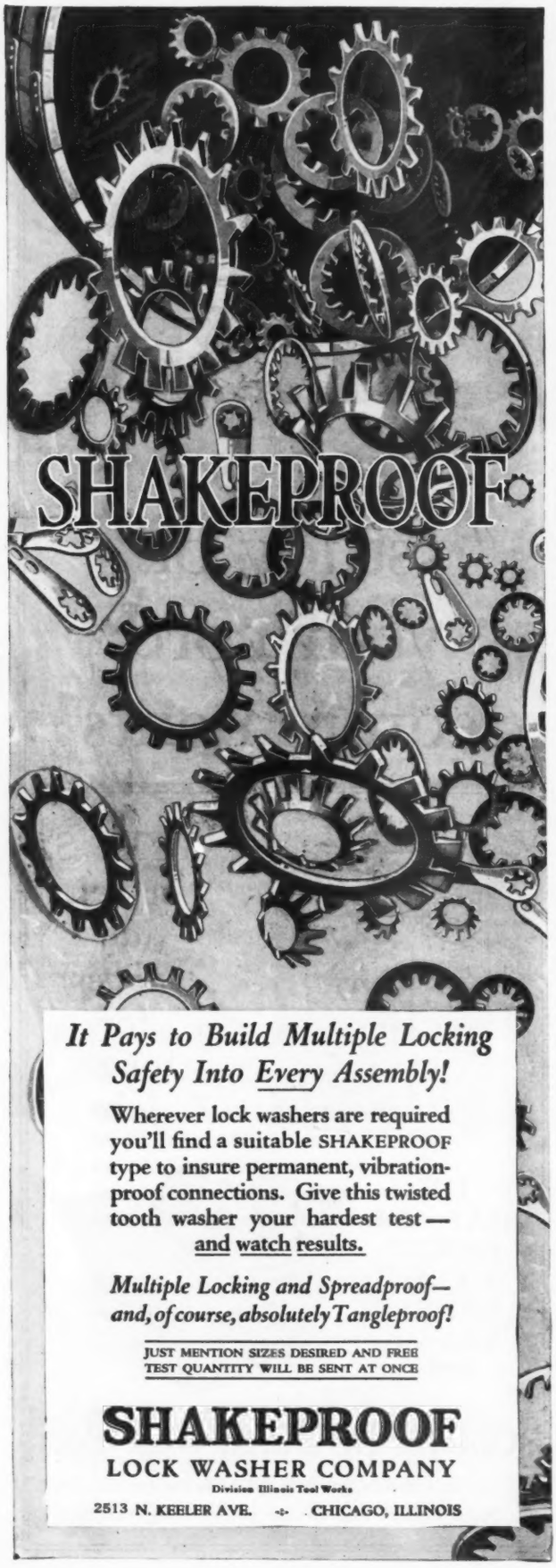
If a problem involving insulation arises and economical production is the urgent need, don't experiment! Call on BRANDYWINE for the positive answer.

ANYWHERE—
ANY TIME—
QUICKLY



BRANDYWINE
FIBRE PRODUCTS COMPANY
1402 Walnut Street
Cleveland Wilmington, Delaware New York
Stamford, Conn., U. S. A.





It Pays to Build Multiple Locking Safety Into Every Assembly!

Wherever lock washers are required you'll find a suitable SHAKEPROOF type to insure permanent, vibration-proof connections. Give this twisted tooth washer your hardest test — and watch results.

Multiple Locking and Spreadproof— and, of course, absolutely Tangleproof!

JUST MENTION SIZES DESIRED AND FREE TEST QUANTITY WILL BE SENT AT ONCE

SHAKEPROOF
LOCK WASHER COMPANY
Division Illinois Tool Works
2513 N. KEELER AVE. -:- CHICAGO, ILLINOIS

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Better fastenings for Bulldog Electric

—in half the time at half former cost

Securing fibre shield to composition panels with Parker-Kalon Hardened Metallic Drive Screws.

WOOD screws were used for fastening fibre shields to the composition switchboard panels made by the Bulldog Electric Co. of Detroit. But even such a comparatively simple operation as turning in four screws into each unit slowed up production. And when a panel happened to be composed of as many as 50 units, it took considerable time to do the job.

By adopting Hardened Metallic Drive Screws for the purpose, they cut the time required to make the assembly in half, with a saving of 50 per cent in cost—and the fastenings so made are far more secure.

How they are used

It is a simple matter to make fastenings with these unique Screws. Only two operations are necessary:

1 Drill a hole.

2 Hammer in the Screw.

The Screws cut their own thread in the material as they are hammered in. A few blows and you have a permanent fastening—a fastening that will stand up even under the most severe conditions.

How they save

Because they cut their own thread, tapping with its breakage of taps is eliminated. The time and labor that this operation would ordinarily consume is saved. And they are so much easier to use than rivets, etc., in hard - to - get - at places.

Bulldog Electric Products Co. also find Drive Screws a speedier, cheaper means of permanently fastening indicator plates to the iron body of their preset switches

Where they save

In the electrical industry there are thousands of applications for which Parker-Kalon Drive Screws can be used with savings of time and labor. Wherever a permanent fastening must be made to iron, brass or aluminum castings, steel, Bakelite, etc.—from attaching name plates to making assemblies where strength is an important factor—these Screws will reduce costs, speed up production and in many cases improve the assembly.

A trial costs you nothing

So that you can determine for yourself the advantages that would be brought about by the use of these Screws on some of your assemblies, we will gladly send samples for test. Just tell us what your assemblies consist of. There is no charge or obligation involved.

Parker-Kalon
TRADE MARK
Hardened Metallic
REG. U.S. PAT. OFF.
Drive Screws

PATENTED JAN. 29, 1924 - No. 1482151
OTHERS PENDING

Parker-Kalon Corporation
190-204 Varick St., New York

Please send me a handful of Hardened Metallic Drive Screws. I want to try them out for

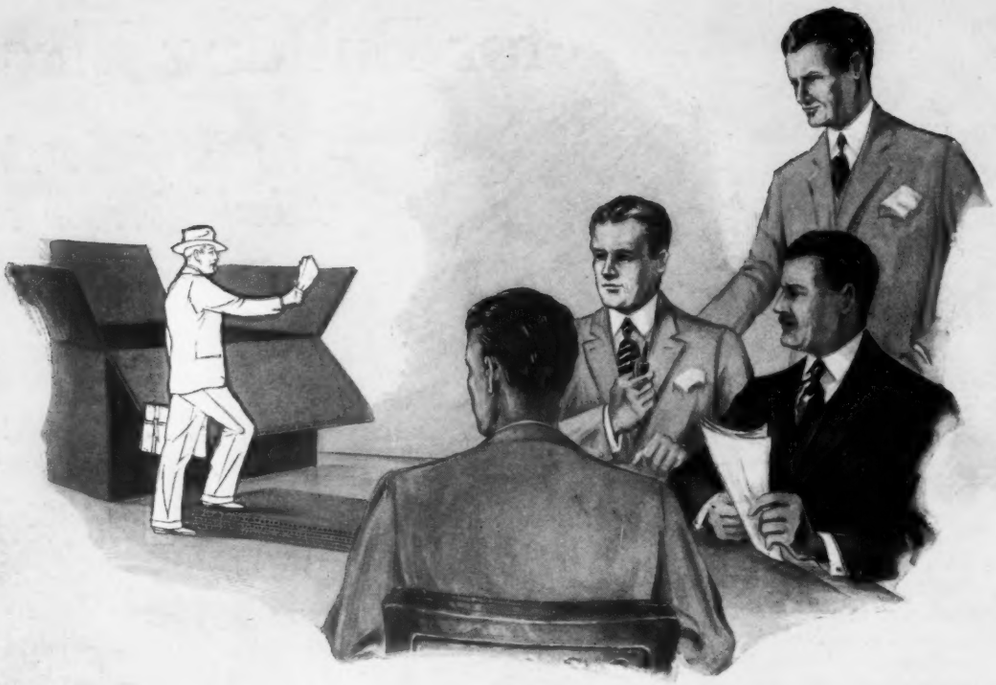
.....

Name .....

Address .....

.....

PARKER-KALON CORP., 190-204 Varick St., New York, N.Y. Distributed in Canada by Aikenhead H'dwre. Ltd., 17-21 Temperance St., Toronto



Here's How Package Engineering Will Save You Money

ONE of your most important operations is packing your product for shipment. The right method means increased economy and good will. *Extra* savings and *extra* sales build extra profits.

One of the 50 H & D Package Engineers is located near you and is ready, able, and willing to give expert assistance in improving your packing and shipping with a saving over previous methods.

By the "Package Engineering" method your product, packing facilities, means of transportation and consumer preferences are *all* analyzed. The Shipping Box that best meets these requirements is then designed and recommended.

Write today for appointment and secure, at no cost to you, definite packing and shipping facts of great importance to every manufacturer who packs his products in shipping boxes.

THE HINDE & DAUCH PAPER COMPANY
309 *Decatur Street* *Sandusky, Ohio*

H&D

Only a satisfactory Shipping Box, properly and punctually delivered, can account for the ever increasing number of firms who ship in H & D Corrugated Fibre Shipping Boxes.

An H & D Package Engineer will be glad to place at your disposal the knowledge gained through a thorough and practical study of shipping and packaging methods.

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QUICKLY

BRANDYWINE
FIBRE PRODUCTS COMPANY
1402 Walnut Street
Wilmington, Delaware
Cleveland New York
Stamford, Conn., U. S. A.

Minneapolis-Honeywell Protectorelay in which Belden Wire is used exclusively.
Above: Burner Boss, made by Absolute Contactor Corporation, uses Belden Special Lead Wire.
Mercoid Thermostat, made by the Mercoid Corporation, in which a special Belden Flexible Wire is used.
Belden SPECIAL Lead Wire

Special Wire Service

for Thermostatic Control Manufacturers

CONTACTORS for delicate controls operated by either temperature or light require leads of remarkable flexibility, durability, and reliability.

By cooperating with manufacturers of these instruments, Belden engineers have developed a wire to exactly meet their requirements. This remarkable wire consists of hundreds of fine copper wires, stranded together so that it is as flexible as a string. It stands thousands of operations of the contactors without the slightest tendency to wear.

The same Belden engineering service which has helped thermostatic control manufacturers solve their problems will also help solve your wire problems.

The assistance of Belden engineers is yours for the asking. Write them.

BELDEN PRODUCTS

Beldenamel and Textile Magnet Wire
Coil Windings
Beldenmold (Molded Bakelite Products)
Automotive Wires and Cables
Airplane Assemblies
Radio Wires, Cords and Cables
Rubber Covered Wires
Armored Cables
Flexible Armature Wires
Motor Lead Wires
Braided and Stranded Copper Cables
Cotton Sleeving

Belden Manufacturing Company
2310B South Western Avenue Chicago, Illinois

Specify Belden

The Test Supreme!

Every nerve tense—every part straining to capacity to gain the terrific speed that wins the race.

The failure of one wire in the electrical system would mean defeat. Only perfect wire—perfect insulation—is capable of withstanding such supreme tests.

The enlargement above shows Dudlo enameled and double cotton covered wire—a type of insulation used extensively where severe conditions are encountered by the electrical apparatus.

Complete Information Gladly Furnished On Request.

Dudlo magnet wire is made in all combinations of enamel and fabric insulations and shipped on spools or in coils as illustrated above.

DUDLO

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA

56 EARL ST. NEWARK, N. J. | 105 W. ADAMS ST. CHICAGO, ILL. | Division of THE GENERAL CABLE CORPORATION | 274 BRANNAN ST. SAN FRANCISCO, CAL. | 4143 BINGHAM AVE ST. LOUIS, MO.

THE word "Formica" is the mark of an exceptionally good and exceptionally uniform insulating material .... phenol fibre at its best.

It means that your shipment comes from the largest plant in its industry, with a most varied equipment of modern fabricating machinery.

That plant is near the center of industry ..... with the shortest possible average haul and the quickest possible average delivery to manufacturers everywhere.

THE FORMICA INSULATION COMPANY

4638 Spring Grove Avenue Cincinnati, Ohio

FORMICA

Made from Anhydrous Bakelite Resins

SHEETS TUBES RODS

Electrical Manufacturing

Reg. U. S. Patent Office

• Production • Marketing • Administration • Repairing •

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Team Play for the Future

By LEWIS E. PIERSON

President, Chamber of Commerce of the United States

MODERN management stands as the representative of three separate and distinct interests: It represents capital, which supplies the plant. It represents labor, whose progress depends upon the competency and the vision of those in management. It represents the public, which uses the product, and which must rely upon industrial leadership for the maintenance of national prosperity.

No man can move among our industrial leaders today, without finding that they are conscious of this triple responsibility. It is not the public which is working and striving for team play. It is the executive who knows the necessity for intelligent cooperation in charting his course through the complexities of modern industry.

It is therefore with entire confidence that I submit the belief that the time has come to make a further step in the direction of more intelligent and more intensive cooperation.

We must find a way to cooperate on problems before they arise. We must team play for the future.

Nothing could induce us to abandon voluntarily our trinity of high production, high earning, and high consumption, yet unless we can work out more scientific methods of cooperation and team play, we can never hope to secure the full benefits to which this productive policy entitles us.

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461 Eighth Avenue, New York, N. Y.

Chicago Office: 1742 Monadnock Block, L. C. Bassett, *Manager* **Cleveland Office:** 501 Caxton Building, Harry Krohn, *Manager*

Another new . . . . . G-E product . . . . . .

TEXTOLITE LAMINATED

TEXTOLITE laminated is composed of thin, non-metallic sheets impregnated with synthetic resin and compressed in powerful presses.

Millions of pounds of plate, rod, and tube have been manufactured by General Electric for its own use during the last five years.

This huge production demanded extensive facilities for manufacture, and resulted in unsurpassed technical experience.

General Electric offers these advantages to every user of high-quality laminated materials; and it further offers the unexcelled resources of its famed research laboratories and its world-wide service.

The same high quality which distinguishes G-E electric equipment is built into every piece of Textolite laminated.

Complete stocks of standard rod, tube, and plate are always on hand; and special sizes and shapes can be supplied on short notice.

Inquire at the nearest G-E office for complete information.

885-14

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

HANDY & HARMAN HANDY SOLDERS QUALITY SERVICE

First Hand Studies in the use of "Handy"

SILVER SOLDERS

by Investigator

HANDY & HARMAN FOUNDED 1867 QUALITY SERVICE

Silver Soldering in Vacuo

THE most elaborate and costly set-up for silver-soldering I have seen thus far in my travels is that of a manufacturer of X-Ray apparatus in Chicago.

In order to solder a 7/32 in. nickel coil into the copper target, which serves as the anode of their high-voltage water cooled therapeutic X-Ray tube, they developed a unique system, in which the soldering is done inside a huge vacuum tube, by electrically-generated heat, applied to the circumference of the tube.

As will be seen by Fig. 1, the nickel coil, surrounded by its tubular copper shaft, is set into the recess in the target, where it is covered with over-lapping segments of "Handy-BT" silver solder. The vacuum tube is then lowered over the assembly, sealed and completely exhausted.

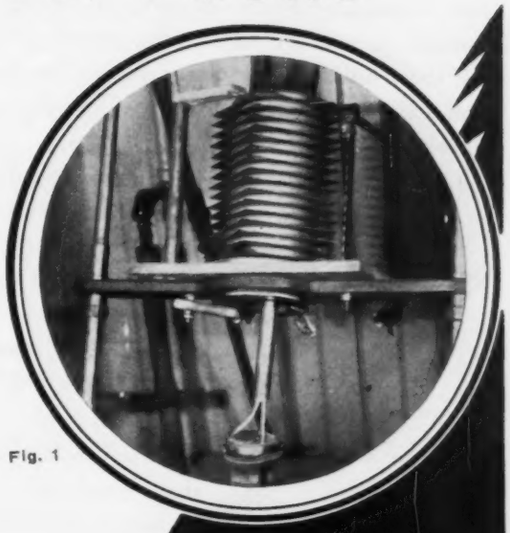

Fig. 1

Fig. 3

Fig. 2 was photographed during the soldering process. At the right is a powerful special-built GE transformer which boosts 220 volt, 60 cycle current to 4,000 volts and 300,000 cycles. This high-frequency current is passed through copper tubing surrounding the vacuum tube where it generates a heat sufficient to bring the parts to a welding heat. This heat is held for 30 minutes, followed by a 60 minute cooling period, before the assembly is removed from the vacuum. No flux is used; but the parts are thoroughly cleaned with nitric acid before soldering. Fig. 3 shows the finished weld.

This elaborate soldering process is employed in order to remove all occluded gases from the metals.

Fig. 4 shows the target in place in the bulb of the water-cooled, deep therapy type of X-Ray tube. When one considers that only a small quantity of tubes of this type are turned out each month, he is impressed with the extraordinary lengths to which this concern goes in order that this one joint shall be as perfect as man's engineering skill, highly-developed equipment—and **silver solder**—can make it.

Fig. 2

Send for our "Handy Book of Silver Solders" "E"

Handy & Harman

Executive Offices

57 William St., New York

Plants—Bridgeport, Conn.
Providence, R. I.
Fulton and Gold Sts., New York City

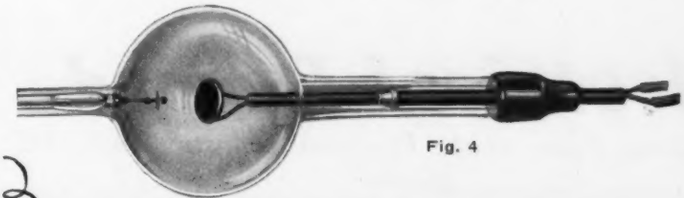

Fig. 4

OCTOBER ELECTRICAL RECORD

In October of each year electrical buyers turn their thinking to Christmas buying and the planning of their holiday selling program.

Buying of electrical commodities that constitute logical merchandise for holiday sales concentration is planned in October. It is during this month that electrical jobbers, dealers, dealer-contractors, contractors and central stations lay the foundation for their holiday program. It is then that they anticipate their wants. It is in October—the key month—that they buy.

It is in this month when most manufacturers initiate their Christmas merchandise selling program. And it is in October when their most determined advertising effort is put forth.

For the past twenty-one years ELECTRICAL RECORD has recognized this with the result that each year for that length of time, it has made of the October issue the featured "Annual Holiday Goods Buying" number.

Concentrating on the holiday appeal, the October ELECTRICAL RECORD finds instant and most favorable reaction on the part of subscribers. There is stressed that which the buyer is most interested in at the time. He is given, editorially, a picture together with descriptive data of every electrical or radio product which is suitable for Christmas merchandise. His source of supply, suggestions for stock, etc., etc., are given him in complete and usable form.

Since every buyer is also a seller, practical selling ideas, window trims, store displays, follow-up direct-mail and newspaper advertising suggestions are furnished him, to move the merchandise he buys—to help the merchant-reader of ELECTRICAL RECORD to increase his stock turnover.

Every manufacturer of those

Electrical Christmas Gifts

Christmas Tree Outfits
Clothes Washers
Cigar Lighters
Cooking Utensils
Dishwashers
Electric Perfumers
Fireless Cookers
Flashlights
Floor Waxing Machines
Hair Driers
Ironers
Irons
Lamp Adapters
Lamp Dimmers
Loud Speakers
Massage Vibrators
Milk Warmers

OCTOBER ELECTRICAL RECORD 20,000 CIRCULATION

Electrical Record

The Business Paper of the Electrical Industry since 1892

Member

A. B. C. A. B. P.

is the "Christmas Buying Number" for the electrical trade

products which are logical gifts at Christmas time has in October ELECTRICAL RECORD a favorable and most timely opportunity to tell his sales story to the electrical industry's biggest and longest established buyers.

The special Christmas color section reserved for this feature is truly an issue within an issue. All pages relating to Christmas, either editorially or in advertising, will be grouped together. Every advertising message will have a preferred position. Every advertiser will have his advertising displayed in the Christmas colors. Every bit of such advertising ties in with timeliness.

All advertising will be directed to 20,000 of the select buyers of electrical products. This is the largest distribution of **any** electrical paper among electrical dealers, dealer-contractors, contractors, central stations and jobbers. ELECTRICAL RECORD'S **paid** circulation exceeds that of any other paper among individual company buyers.

Only 71 Christmas buying and merchandising days remain after the date of publication of October ELECTRICAL RECORD. A big job is to be done by every manufacturer in that time.

October is the manufacturer's big gun in that campaign. Use it adequately. Reserve your space now because the feature section is already being planned.

We shall be glad to render what assistance we can to any manufacturer or his sales and advertising counsellor.

Electrical Christmas Gifts

Motion Picture Apparatus
Pads and Blankets
Portable Lamps
Radiators
Radio Receiving Sets
Phonographs Adapters, etc.
Ranges
Refrigerators
Sewing Machines
Television Apparatus
Toilet Articles
Toys and Novelties
Transformers
Vacuum Cleaners
Water Heaters
Radio Reproducer (Units)

How one advertiser used the Christmas Buying Number last year.

THE GAGE PUBLISHING CO., Inc

461 Eighth Ave., New York, N. Y.

Publishers of

Electrical Record
Electrical Manufacturing
Metropolitan Electrical News
Gage List of Electrical Buyers

OCTOBER ELECTRICAL RECORD 20,000 CIRCULATION

Competition . . .

the life of trade and the early death of a host of manufacturers

Stewart Die Casting service produces many definite advantages in the manufacture of hundreds of different types of product, each advantage contributing to the major feature of overall economy. Production economies include:

- Reduced unit costs
- Simplified design
- Complete interchangeability and simpler, faster assembly
- Release of manufacturing facilities for other work
- Release of working capital
- Elimination of manufacturing "grief"

Improvements in finished products are:

- Better finish
- More striking sales features
- Enhanced performance based upon accuracy and simplicity of design
- Fewer adjustments and less "free service" required
- Improved performance as a result of detail improvements possible with the Stewart Die Casting process.

Stewart engineers are specialists in die design and in the adaptation of products to production as die castings. Their services are available to manufacturers without charge. The Stewart plant is the largest in the world devoted exclusively to die casting. Automatic machinery, principally of Stewart design, and an organization highly trained in the Stewart process insure economy, accuracy, and unrivalled standards of service.

COMPETITION, more aggressive than ever before, extends today to a contest between industries for the consumer's dollar. It causes a new refinement and perfection of products and an examination of costs more intensive than ever before.

Stewart Die Casting service enables several hundred manufacturers to look this new competition in the eye with a sense of security.

Stewart service not only reduces unit costs. "Cost per piece" frequently fades into insignificance beside the advantages of faster, simpler assembly, interchangeability, elimination of spoilage, simplified design,—and other definite results of production by means of the Stewart process of die casting.

Stewart engineers frequently make suggestions that improve performance features and add definite sales appeal to the finished product. Definite details of the advantages of Stewart Die Casting as applied to your product will be furnished on receipt of blueprints or samples.

The Stewart Die Casting Corporation

4500 Fullerton Avenue, Chicago, Ill.

Detroit Pittsburgh Milwaukee Dayton
New York City St. Louis Cleveland

Stewart

E. M. 8-Gray

SHOCK-PROOF

—there are many molding jobs that require a plastic of mechanical strength such as only *Herculite* possesses

Any electrical manufacturer desiring to lower production costs will find in HERCULITE a tremendously strong, shock-resisting plastic ideal for the molding of many parts wherein ordinary compounds are less adaptable.

HERCULITE is an extraordinary plastic with a flowing point below that of other compounds, yet it possesses every one of their economical characteristics.

It is far from brittle; it is highly dielectric; it is surprisingly uniform and develops a finish more than comparable with that of synthetic compounds.

Send for a test sample of HERCULITE and outline any problem you may be working on.

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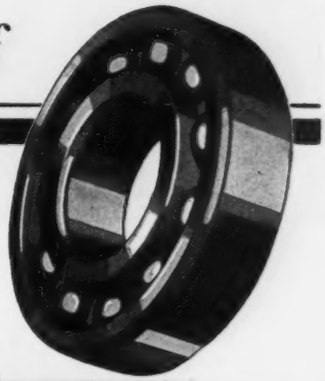

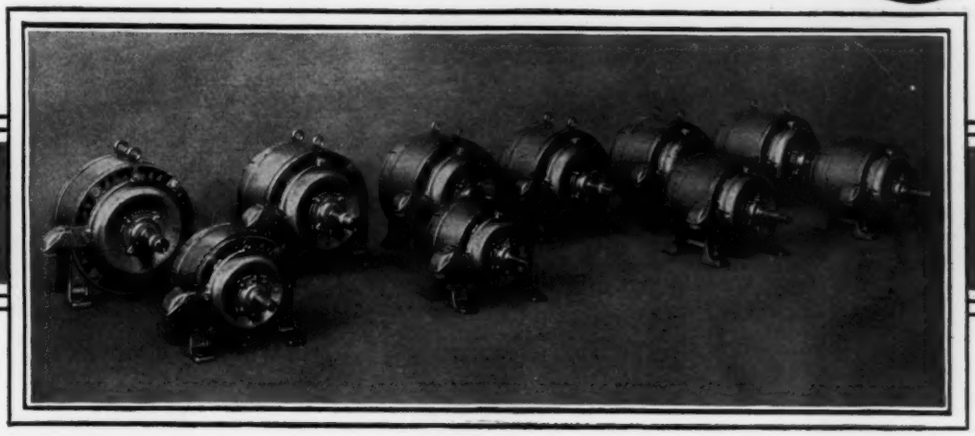

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WAGNER general purpose electric motors are obtainable with ball bearings as standard or optional equipment.

Noticeable in the 10 Wagner fan-cooled motors shown is a compactness of construction which can be best obtained with ball bearings. These 7 1-2, 10 and 15 h.p. motors have greatly reduced overall dimensions and, therefore, economize valuable space.

While compactness is an essential detail of modern design, it is but one of the many advantages and economies obtainable by the use of New Departures.

Long life, permanent retention of original accuracy, ease and economy of maintenance, together with many others are explained in two booklets published by the Engineering Department. They are "Cutting Your Costs" and "Booklet K". Yours for the asking. Write now.

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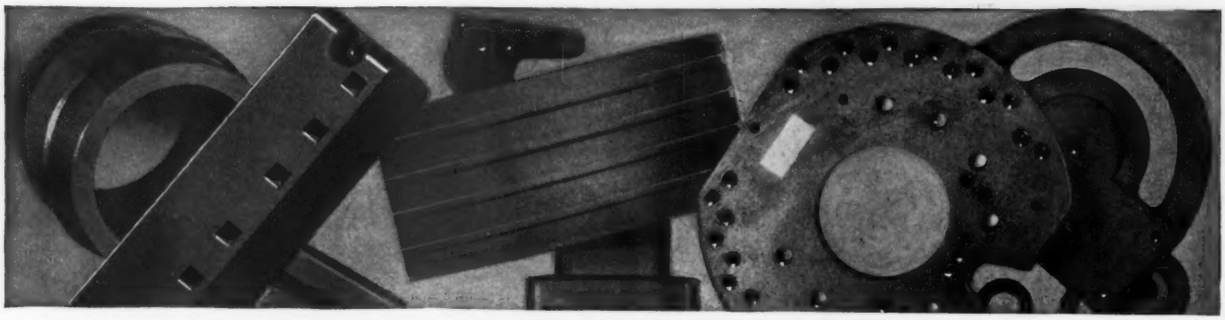

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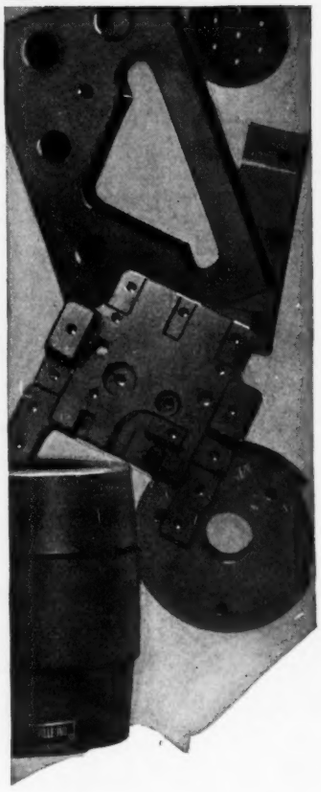

BY using Johns-Manville moulded Asbestos Ebony for electrical devices requiring such material you make certain of the three chief requisites for all such special shapes.

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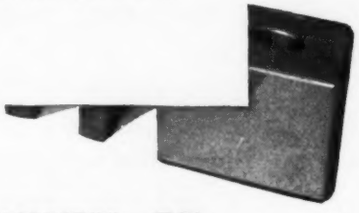

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Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 2 AUGUST - 1928 Number 2

TEAMWORK IN BUSINESS

By Edwin B. Parker

Chairman of the Board, Chamber of Commerce of the United States

TEAMWORK is not new to business. Business has a tradition, through teamwork, for pointing the way to higher concepts of the public interest. The tradition goes back a long way. In the early part of the ninth century Charlemagne recognized the "ancient custom of commerce" as something definite that had been created by the merchants themselves, and something conferring advantages to which other classes had not yet attained. In the general insecurity and lawlessness that prevailed in the early part of the Middle Ages the merchants—the business men of the day—organized for their own protection, and to govern their transactions, developed principles which were far in advance of the principles of the laws of their times, and provided their own tribunals where these principles could be equitably and promptly applied. At a time when legal proceedings were notoriously dilatory and technical and where obligations were enforceable only when embodied in formidable documents of great artificiality, business men evolved the law merchant and themselves so administered it that an English judge of the eighteenth century referred to it as "a system of equity founded upon rules of equity and governed in all its parts by plain justice and good faith." What higher tribute could be paid any body of men with respect to their inter-trade relations?

BUSINESS today is profiting by the example set by the merchants of the Middle Ages, and transactions involving billions of dollars annually in our own country occur under conditions of self-government in business prompted by the dictates of "plain justice and good faith." Statutory fiat has never created a single great modern market, nor originated facilities that have made one possible.

The growth and development of business and the progress and well being of society as a whole demand unhampered opportunties for individual effort and initiative, which is rendered increasingly difficult in proportion to the increase in Government regulation of business. On the other hand, methods and practices designed to secure immediate gains, without reference to the effect on the general public or the ultimate effect on business itself, sometimes renders restrictive and regulatory legislation in the public interest imperative. Business chafes under such legislation. The remedy lies in its own hands. It can, if it will, be governed and regulated by its own rules and principles of business conduct enforced by the most effective of all sanctions—a wholesome public opinion—created and fostered by business itself.

BUSINESS performs its function by seeking out new methods to reduce costs; by developing new products of ever-increasing utility in commodities and services, and by evolving new methods to advance the common welfare. It is peering into the future, making forecasts of conditions in months and years to come, and backing its forecasts with all it possesses. It does not pause to philosophize about the future; it gathers all that philosophy can offer—all that science can give—compounds everything it can garner from every source, however humble, with all the hard facts of daily experience and, basing its conclusions upon the product, it acts. Thinking little of the past, scarcely taking note of the present, it is intent upon the future into which it projects itself. That it may gage the future correctly, it requires more than the cooperation of the public—it must have the confidence of the public. Any disturbance of that confidence, any detriment suffered by the public which will cause a moment's hesitation in the free bestowal of that confidence, withdraws from business the foundation of its future.

Making ADVERTISING *Pay*

If advertising is to live up to its opportunities as a business-building force in the existing buyer's market, it must learn how to develop the capacities of its own "problem-solvers" and the buyers also

WHEN one of the foremost leaders in America's educational world makes a survey of present-day advertising, finds it wanting, and then declares that the six great mediums of advertising are not as effective as they should be, it is time for the business world to give serious thought to what he has to say. On this and the following pages, the editor has arranged under twelve points the message which Dr. Hollis Godfrey gave to the advertising world at the convention of the International Advertising Association at Detroit in July.

THE EDITOR

1. Per capita growth of wealth in the United States has slowed down.

DURING the years since 1922 there has developed in the United States a condition which existed only once before in its history. The per capita growth of wealth of the people of the United States has slowed down. The curve of rising wealth, which has given us more comforts than any people have had before in history turned definitely downward in 1922 and has not turned upward since. Individually in the years since then we have made less gain in wealth each year than we had made in the years that went before. Only once before, since the industrial revolution, had that curve of rising wealth turned downward. That occurred between 1870 and 1880 and immediately preceded the great quantity production period through which we have just passed. Then, as now, the distribution of goods and services to meet the needs and wants of men slackened, but from a different cause. Their needs and wants had outrun the capacity of machines to supply them. Now machines have outrun the needs and wants of the people whom they supply.

2. As a result, the problem of today is how to build business, how to increase the growth of wealth, in the buyer's market.

Gradually this change has affected almost all who make or sell goods until men have come to recognize that we are in a buyer's market. So great is the change, that there is not a single task before us today more important than this one of solving the problem of the growth of wealth, and that includes the development of business, in the buyer's market. How to tackle this problem, how to find the answer, is the big question of the hour in the world of business. And the answer is of prime importance to the advertising executive who must create business under the conditions which exist in a buyer's market. In a seller's market goods are sold largely by presentation. In a buyer's market they are sold chiefly by education. In the former, the emphasis is on quantity in production. In the latter, the emphasis is on quality in use.

3. Altogether too much advertising is not keyed to the buyer's market, as it should be.

The importance of this outstanding task becomes even more evident when we consider the present condition in terms of advertising. In a buyer's market advertising as a function should be advancing rapidly. What is happening? Studies of the six great advertising mediums—general magazines, newspapers, business papers, outdoor advertising, radio and direct mail—for the first three months of 1928 as against the first three months of 1927, showed that general magazines, newspapers and outdoor advertising all lost ground. Business papers suffered only a slight loss although one of these papers made a phenomenal gain. Radio gained. And, while accurate figures on direct mail are not obtainable, there is no indication that direct mail gained. In other words, at the time when the growth of wealth in the buyer's market needed the acceleration of advertising work, its use was diminishing. Not only that, but the general spirit of the business world toward the present methods of advertising is not good. Everywhere advertising has been accused of misrepresentation and waste and the diminishing returns from much of today's advertising have been noted.

4. Advertising must discover new methods for making itself more effective.

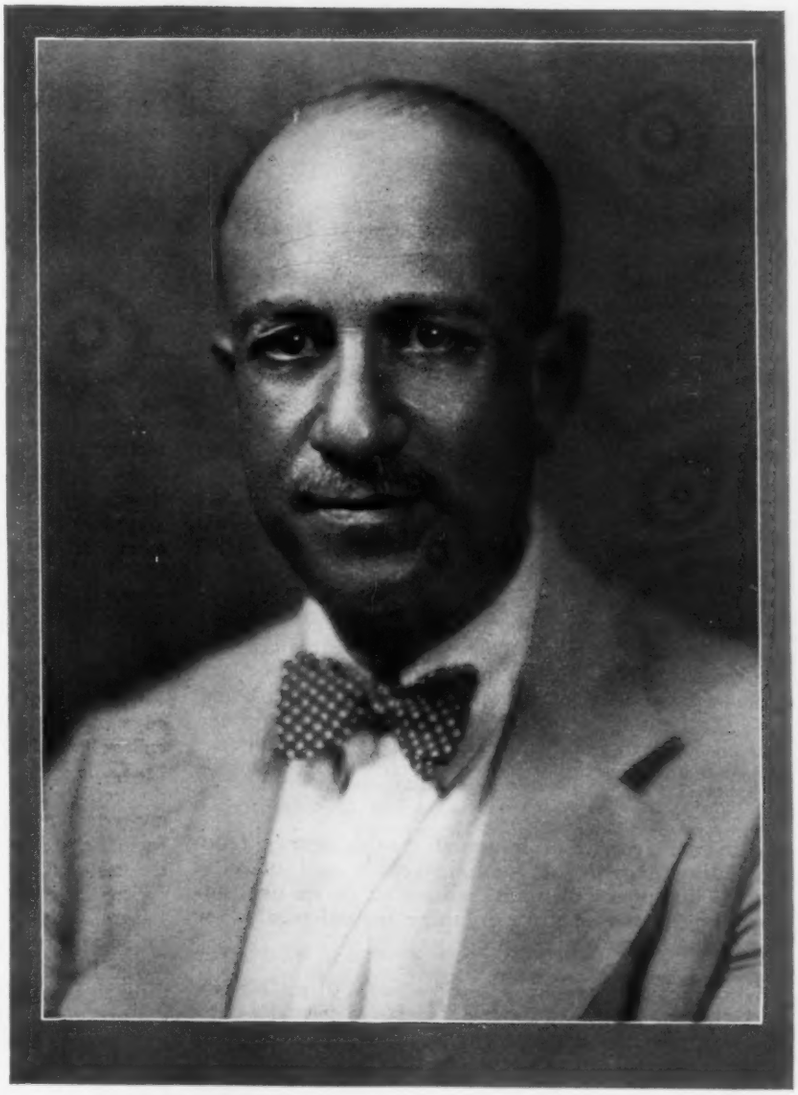
Advertising is just as essential today to the continuation of our growth of wealth, our development of business, as power or finance. Yet much of today's advertising is failing to make its function and use in the buyer's market clear to the men who need most to use it. It is evident that a new examination of the facts needs to be made and a new method of use must be discovered. The very charges made against advertising show that. "Misrepresentation" means lack of fact. "Waste" means lack of understanding of use. Let us turn the light of facts to an examination of the conditions of the buyer's market.

5. Every force used to obtain customer action must be employed with recognition of the fact that action in a buyer's market is reversed from action in a seller's market.

The primary fact of the buyer's market which governs all action for the growth of wealth is this: In a buyer's market action is *reversed* from the action in a seller's market. Initiative of action in a buyer's market comes from the buyer and not from the seller. Initiative of action in a seller's market comes from the seller and not from the buyer. In a true seller's market the seller allots the product, whether it is motors or coal, among his customers. In a true buyer's market the buyer chooses the product he buys from among a group of products, different motors or different fuels, for example, offered him. The action is

in the BUYER'S MARKET

By Dr. Hollis Godfrey
President, Engineering-Economics Foundation, Boston



reversed from one market to the other and—here is the important point—*every force used to obtain action must be employed with recognition of that fact of reversal;* otherwise much of the force employed will be wasted and will not represent the fact. Here is a basis for charges of "waste" and "misrepresentation."

6. Will this reversal of action be permanent?

Once we recognize that the action is reversed in the buyer's market, another question arises: Will the reversal of action be permanent? To answer this question we must examine the means which in any market are necessary to the creation of business. These are vital wealth, factual wealth, and material wealth. All wealth is the sum total of these separate forms of wealth in varying degrees. Vital wealth means the human forces of body and mind. Factual wealth means books, journals, libraries, schools, colleges, and laboratories, and all other forms of human knowledge, all other depositories of facts. Material wealth means goods like food and shelter, physical services like transportation and communication, and financial power like the raising of money. These are all of the agencies, or means, which men use today in doing the work that creates wealth. They are all that men have had for centuries past, much as their outward forms have changed in the centuries. The buyer's market, the reversal of action, is permanent because the *rate of growth* of each of the agencies for creating wealth—vital wealth, factual wealth, and material wealth—is such that the initiative of action remains in the hands of the buyer rather than the seller. And that condition will continue until it is changed by a major social or economic upset such as another world war or a devastating epidemic or some other great disaster to the human race.

ADVERTISING today is operating on a basis of factual wealth developed for the quantity production period and the seller's market, not for the buyer's market, and it is endeavoring to accelerate the growth of wealth under conditions which involve friction and inertia at almost every point.
Dr. Hollis Godfrey

Now let us amplify this statement. For *analyltical* understanding not only of the reversal of action in the buyer's market but also of the permanency of that reversal, is essential to every business action taken today.

Take vital wealth first: The rate of growth of population, of numbers of human beings, is diminishing in the United States. This makes for buyer initiative for there are fewer people to buy the goods and services made.

Take factual wealth: The rate of growth of men and women educated in the high schools is rapidly advancing. This makes for buyer initiative, for the intelligent and understanding buyer refuses to accept a condition thrust upon him by a seller and seeks an alternative condition when the initiative is his. No better illustration of this could be found than the search for alternate fuels on the part of the buyer. The rate of growth of factual wealth has advanced so rapidly, since the development of modern research, that it keeps constantly supplied the basic reservoir of fact and the relation of fact, which is needed to keep its own rate of growth and the rate of growth of educated vital wealth, of material wealth and of finance advancing

at such speed that the initiative, except for the emergency conditions I have noted, will remain with the buyer.

Take material wealth: The bases of its growth are rapidly advancing. No limit has been found to the productive capacity of the United States. This makes for buyer initiative, as it presents the buyer with quantities of goods not only sufficient for his daily needs, but constantly advancing into the fields of his wants.

7. How can advertising under these changed conditions exert its maximum accelerating effect on business?

On the basis of these two facts that action reverses in a buyer's market and that the present buyer's market is permanent, we can go on to the next question. How can we organize these means of creating wealth so as to get a maximum rate of advance in the buyer's market? Specifically, how can advertising under these conditions exert its maximum accelerating effect on business, on the growth of wealth? To find the answer, we must begin with a fundamental principle, which is as follows:

Growth of material wealth comes from preceding growth of factual wealth and of vital wealth (men and women) educated in its use.

The determination of that principle showed definitely that the source of material wealth was in education. It showed also that the beginning of the growth of wealth did not come with the growth of research—the growth of research shows only in growth of factual wealth—but did come with growth of transmission of knowledge (teaching and publication), understanding, and skill to the men who are responsible for solving the problems of creating material wealth. In brief, growth of material wealth begins with organization of factual wealth in teaching form and with the work of transmission which gives vital wealth the understanding and skill required to solve the problems of a given time.

8. Since growth of material wealth comes from preceding growth of factual wealth and of vital wealth (men and women) educated in its use, advertising must therefore organize factual wealth for use in the buyer's market.

To obtain the maximum rate of advance in the buyer's market, take action at the source. Organize factual wealth in a teaching form usable in the conditions of the buyer's market (which act in reverse to those existing in a seller's market) and organize the agencies of transmission (which are teaching and publication) in such a way as to give understanding of the growth of wealth and to develop the capacities of men and women to solve the problems of the buyer's market.

Now, that principle applies to advertising as directly as to any other agency in the creation of wealth. *Advertising today is operating on a basis of factual wealth developed for the quantity production period and the seller's market, not for the buyer's market, and it is endeavoring to accelerate the growth of wealth, under conditions which involve friction and inertia at almost every point.* By so doing it lays itself open to charges of "misrepresentation" and "waste"—charges which will eventually be brought against all business which continues to operate under the old conditions which are gone.

No stream can run higher than its source and the source of wealth is knowledge of wealth. The great forces of knowledge of merchandising and advertising, added to knowledge of engineering, raised the source of wealth knowledge greatly during the past quarter of a century. It is time in this buyer's market to raise the source again by organizing the knowledge of the use of wealth in teaching form and transmitting it by teaching and publication in terms of the men and women who buy and use wealth and not alone in terms of the specific product they buy and use.

9. Primary agencies for organizing and transmitting facts concerning business are the college and the business paper.

All the processes for organization of the key men and women are known—how to select them—how to organize them—how to teach them—how to teach them to test themselves. All the processes for organization of the subject matter are known—engineering methods proved in the laboratory—measurable economic facts, whose measurement rests on unquestioned laboratory methods dealing with mass phenomena—mathematical processes of complete precision to develop and test the results.

The agencies for organizing the facts in teaching form and transmitting them are known. The primary agencies in organzing and transmitting facts concerning business are the college and the business paper. Alone among the agencies of transmission, these institutions are self-correcting as regards facts. The academic world questions every statement of the college. The reader questions every statement of the business paper as regards both fact and the timeliness of fact. These conditions are true of no other agencies of transmission of fact.

10. Advertising, through education, must develop capacities of its own "problem solvers," and of the buyers also.

One type of college alone develops capacities of knowledge and men for adult education. This is post-graduate college, such as the institution which I have the honor to head, the Engineering-Economics Foundation, which works through the processes of higher adult education to provide understanding of the growth of wealth and to develop the capacities of men and women to solve their problems of the use of wealth.

One group of business papers, the Associated Business Papers, with 128 member publications, organized with education as a primary object, has after many months of study adopted a policy of general adult education to be developed through their papers in terms of the buyer's market and of the use of wealth. This group of publications has related the capacities for creating wealth in the buyer's market to the needs of men in that market.

These two agencies are known and their activities are known. Both of them stand ready to promote adult education which is absolutely indispensable in a buyer's market.

For advertising to adjust itself to the reverse action of the buyer's market, it must gain understanding of the growth of wealth and must develop the capacities of its own problem solvers to solve the problems of the use of wealth by the buyers of all types, not simply to inform the public of a special product. It must continue and expand the great service of advertising and merchandising. But it must add to them adult education. The soil must be fed for the crops to grow. The buyer must be educated today, if the goods are to be sold, and since we know the way to educate the buyer, it is only carrying through an order of work to get the job done.

11. Key men must lead in developing adult education in the business world.

What agencies must be added to gain a starting impulse to advance the growth of wealth in the buyer's market?

To answer that question rightly we must recognize that

(*Continued on page* 100)

SELECTING the *Proper* Carbon Brushes

The choosing of the most suitable type and grade of brush is best considered by means of a general classification of electrical equipment

By W. C. Kalb
National Carbon Company, Inc.

To the operator concerned with the problem of selecting carbon brushes for the machines under his supervision, physical characteristics of the various grades have little meaning. This is due to the fact that those characteristics susceptible to simple and direct quantitative test, such as specific resistance, hardness and breaking strength, have a relatively minor influence on brush performance. Actual performance under service conditions is the subject with which the user of brushes is chiefly concerned. It is, therefore, desirable to study the grades under consideration on the basis of their operating rather than their physical characteristics.

It is a matter of first importance in the selection of brushes to choose a grade which will give reasonable commutation and maintain the commutator surface in proper condition at a minimum cost. While it is true that under severe conditions no brush can eliminate all commutator maintenance, the cost of such maintenance is influenced, to a large extent, by the selection of a brush grade suited to the application. One of the chief sources of expense in the maintenance of commutators results from spotting. In some cases this is traceable to machine defects, such as: winding faults, high mica, or loose commutator segments. In other cases it is directly traceable to poor commutation and may be corrected by selection of a grade with suitable commutating characteristics or by adjustment of the machine so that the brush in use will give proper commutation. Spotting resulting from poor commutation, whether due to the brush grade or machine fault, first appears as burning along the edges of the commutator bars.

A commutator on which edge burning has just begun is illustrated in Figure 1. With continued operation an appreciable spot would doubtless develop on that portion of the commutator shown in the center of the illustration. This same commutator after operating with a grade of proper commutating characteristics is shown in Figure 2. The well polished surface of the commutator and the clean sharp edges of the segments are in striking contrast to the condition shown in Figure 1.

Under some conditions it is impossible to go beyond a certain point in improvement of the commutator surface by attention to commutation. In such cases, the use of an abrasive brush may be resorted to, to prevent formation of spots on the commutator by scouring away the effect of sparking and preventing this action from becoming cumulative. Extremely abrasive brushes are seldom to be recommended, but there are many applications on which a brush with a mild abrasive characteristic will give economy of operation in comparison with a strictly non-abrasive grade.

Apart from commutator maintenance, brush performance may be further judged by the influence on temperature. Temperature is one of the most vital factors in the manufacture of any electrical apparatus. Excessive temperature not only is destructive to the apparatus itself in the more extreme cases, but, when present to an even lesser degree may prevent equipment being operated up to its rated capacity. Low temperature, on the other hand, is equivalent to reserved capacity, permitting machines to carry occasional overloads without injury. There are several ways in which brushes influence the temperature of electrical machines, the most important of which is commutation. It is preferable on this account to use brushes of relatively high contact drop on machines with standard voltage in order to minimize the heating effect of commutation current. Brush friction is also of importance in this respect, especially on machines with high surface speed and those where the area of brush contact is relatively large in proportion to the total commutator sur-

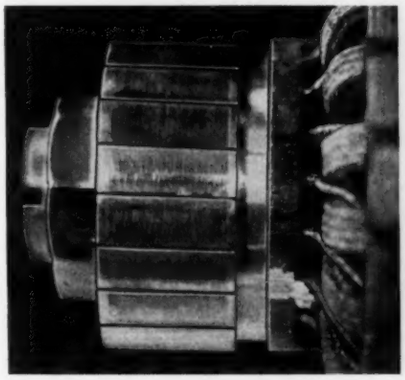


Figure 1. This commutator surface shows edge burning which has just begun. An appreciable spot would soon develop with continued operation

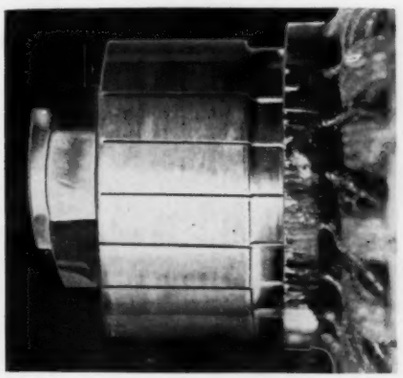


Figure 2. The commutator in Figure 1 is shown here after operating with a brush having the proper commutating characteristics. Note the clean segment edges

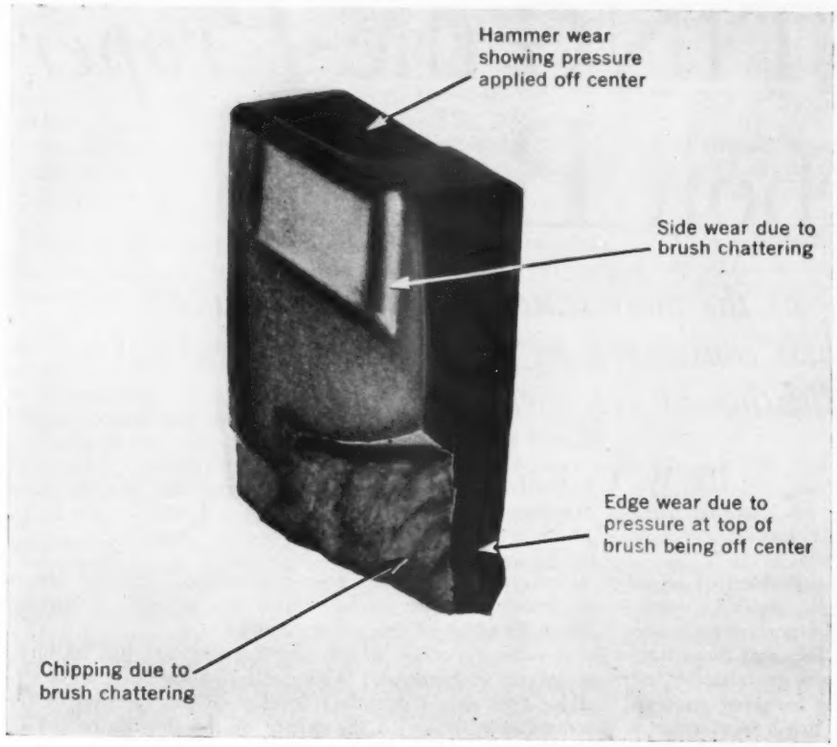

Hammer wear showing pressure applied off center
Side wear due to brush chattering
Edge wear due to pressure at top of brush being off center
Chipping due to brush chattering

Figure 3. The destructive action of chattering on a carbon brush is shown in this illustration. It will be noticed that the chipping at the face is quite pronounced and serious side wear has occurred at the side of the brush under the tension arm

face. It is never advisable to use a brush at commutator surface speeds above the value recommended by the brush manufacturer. Specific resistance of the carbon has little influence on temperature since the carrying capacity of the brush is influenced to a greater extent by commutation and frictional heat than it is by the I^2R loss of the load current through the body of the brush. On low voltage machines, such as plating generators, the contact drop of a carbon brush would represent an excessive item of loss and prohibitive temperature would result from the use of a carbon grade. Machines of this type offer much less difficulty in the way of commutation than those of standard voltage, making possible the use of metal graphite brushes with very low contact drop and consequent lower heat loss at the brush contact.

A third item of brush performance to be considered is that of brush life. This is a point, however, which should not be over-emphasized. Improvement in brush life is often possible through maintenance of proper conditions on the machines. Poor commutator surface, high mica, poor undercutting and brush holders of improper design insecurely mounted and set at wrong angles or with tension improperly adjusted, represent a few of the mechanical causes of short brush life. Any condition resulting in vibration or chattering of the brushes is destructive to their life as well as injurious to the machine itself.

Mechanical Wear and Brush Life

THE destructive action of chattering on a carbon brush is shown in Figure 3. It will be noted that chipping at the face is quite pronounced while serious wear has occurred at the side of the brush and under the tension arm. Part of the trouble, in this instance, was due to the tension not being applied at the center of the brush top, resulting in the edge wear observed and possibly being the initial cause of the chattering which evidently existed. The mechanical wear of a good commutator surface causes but little reduction in brush life, a much greater amount being due to the disintegrating effect of commutation even when no visible sparking is observed. High current density in the brushes and high peripheral speed of the commutator tend toward excessive temperature at the brush face with resultant limitation on life. While it is desirable to obtain as long life as possible, this should never be accomplished at the sacrifice of commutator wear, cost of commutator maintenance, good commutation or machine capacity. Where this is done, the apparent economy is sure to prove expensive in the end.

Preparation of the commutator surface is of equal importance to selection of suitable brush grades. Undercutting of mica is recommended for practically all classes of service. It is important, however, that this operation is carefully performed if full benefits are to be realized. Fins of mica, such as may be seen in the micro-photograph shown in Figure 4 should be carefully removed. These may be largely avoided in the first place by using a cutter fully equal to the thickness of the mica and guiding it accurately through the slot. Rough bar edges also visible in this illustration should be removed by chamfering. The commutator should be given a true cylindrical form by turning or grinding, since a commutator which is out of round cannot be properly restored by the use of a hand stone or sand paper block. A final polishing action is necessary to give the commutator the desired surface. A micro-photograph of a commutator which has been finished with a fine grain sand paper is illustrated in Figure 5.

The micro-photograph discloses ridges of appreciable depth which it will be realized have a decided abrasive action on the brush face. A non-abrasive electro-graphitic brush applied to such a commutator will fill these minute grooves with a deposit of free carbon, giving the entire surface a blackened appearance. Several days may be required for the brush to remove these ridges and establish the proper polish. Figure 6 is photographed to the same scale as Figure 5 and shows the surface of a properly polished commutator.

Polishing Commutator Surfaces

FOR final polishing of the commutator surface a hard maple block is an excellent tool. Polishing compounds may be used, but where this is done care should be taken that none of the polishing material becomes imbedded in the brush faces since this condition greatly increases the friction of the brushes and may result in destructive chattering or excessive commutator temperature.

The angle at which a brush is operated has an influence on the grade to be selected. If the brush is held in a leading position, as illustrated in Figure 7, brushes with high coefficient of friction must be avoided unless the angle of inclination is sufficient to avoid all chances of the brush being pulled away from the leading side of the brush holder. If holders are set to operate in the trailing position graphite brushes should be avoided due to the wedging effect between the commutator and the trailing side of the brush holder, with the resultant tendency toward serious side wear on a soft graphite grade.

The influence of brush angle in both leading and trailing operation is clearly illustrated by the vector diagrams in

Figure 7. In these diagrams the lines OT and OF represent, respectively, the relative values of the spring tension applied parallel to the brush holder sides and the frictional pull at the brush face tangent to the commutator surface. The resultant of these two forces is the line OR which in turn may be resolved into two components, OH (the pressure against the side of the brush holder), and OP (the actual resultant pressure between brush face and commutator surface). It will be noted that at a 30 degree leading angle the brush is held with appreciable pressure against the leading side of the holder. At a 15 degree angle, however, the component OH, representing the pressure against side of holder, has become very small and were the frictional pull OF appreciably larger in relation to tension OT, this value would become negative and the brush would be pulled away from the holder side. In the trailing position the brush is always held against the trailing side of the holder at a pressure greater than the frictional pull at the brush face. If the inclination is too great as shown in the 30 degree trailing position this pressure becomes excessive and may interfere seriously with the freedom of movement of the brush in the brush holder box. The pressure between brush face and commutator is also raised appreciably above the applied tension. In the light of the foregoing analysis it is generally recommended that for leading operation the inclination of the brush holder should not be less than 30 degrees, 30 and 37½ degrees being the angles generally used by electrical manufacturers. For trailing operation the inclination should not exceed 15 degrees.

The question of selecting the most suitable type of brush will be considered in this article on the basis of classification of electrical equipment in conformity to general type rather than on the basis of specific classes of service.

Generators and Rotary Converters

FOR generators and the D.C. side of rotary converters it is recommended that commutators be undercut regardless of speed or service conditions. This permits the use of high carrying capacity low friction electro-graphitic brushes. The superior commutating characteristics of the electro-graphitic brush as a class, makes it peculiarly adapted to this type of equipment, since the selection of a suitable grade practically eliminates expense of communtator maintenance. Some grades of graphite brushes are also used with success on this class of equipment. A few generators will be found with brushes operating in the leading position at less than a 30 degree angle. Low coefficient of friction becomes the primary requisite in the selection of a brush for such application, since chattering results when a brush of appreciable friction is used. If it is desired, in spite of the advantages of undercutting to operate generating equipment with flush mica commutators, a brush with some polishing action, or even a mild abrasive brush is essential. Only those grades should be considered which are recommended for current densities and peripheral speeds as high as or in excess of those encountered on the application under consideration.

Constant speed D.C. industrial motors seldom offer severe conditions and can usually be taken care of by either electrographitic grades or carbon graphite grades with mild abrasive action.

Adjustable speed D.C. motors offer much the same problem as constant speed. In some cases, those in which speed adjustment is effected by variation of the field strength, commutation may not be as good as on the average constant speed motor. On such types, greater emphasis must be given the commutating characteristics in the selection of a brush.

Industrial Type Series Motors

SERIES motors are used in a variety of industrial applications such as crane motors, hoists and numerous applications in steel mills. Commutating characteristics of series motors are seldom as good as those of shunt motors, and undercutting of commutators is essential to lowest maintenance cost. Even with undercut mica some polishing action is required of the brush so that the harder grades or those of mild abrasive characteristics are preferred for series motors. Partially graphitized grades of substantial hardness have sufficient cleaning action for this service and are extensively used. Under extremely severe conditions and in all cases where the mica is flush, carbon graphite grades with mild abrasive action are preferred.

Railway motors, being of the series type, present the same fundamental conditions as those just described for series motors in general. Much higher speeds are encountered in railway motors, however, as well as longer periods of coasting during which the brush, carrying no current, has opportunity to polish the commutator. It thus becomes desirable on railway applications to give more consideration to the friction of the brush and less to its polishing or abrasive characteristic. Partially graphitized grades of lower friction than those used on the industrial series motor applications are preferred for railway service, while some carbon graphite grades of low friction and mild polishing action may be used with excellent results.

Commutating type A.C. motors offer more severe commutating conditions than are normally found on D.C. motors and call for the use of brushes with the very best possible commutating characteristics. Flush mica should never be used on these motors for industrial applications. In fractional horse power sizes it sometimes becomes necessary to operate A.C. motors with flush mica where extreme quiet-

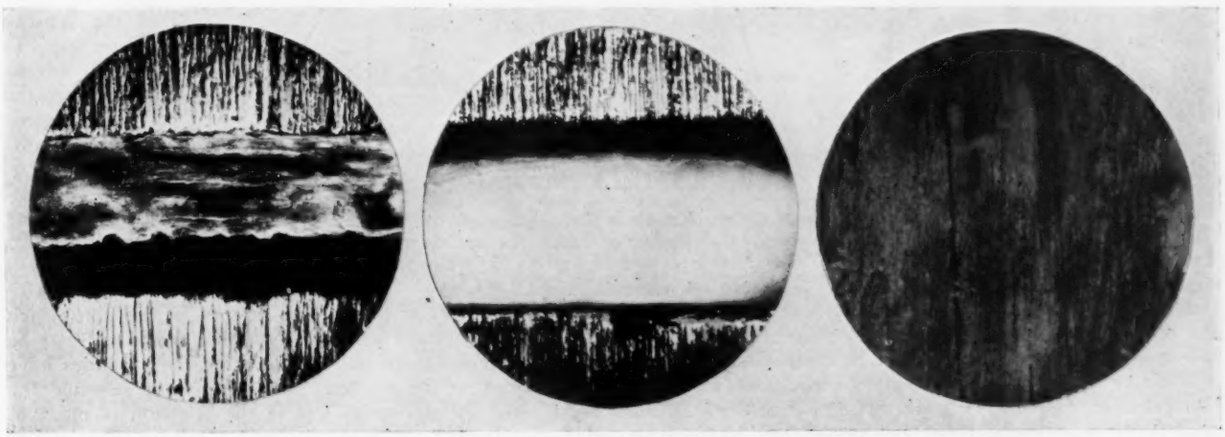


Figure 4. The mica fins visible in the micro-photograph at the left above could have been avoided by using a cutter fully equal to the width of the mica segments. Figure 5 shows a micro-photograph of a commutator finished with fine grain sandpaper. Figure 6, above at the right, shows, to the same scale as Figure 5, the surface of a properly polished commutator

ness of operation is essential and the slotting of the small diameter commutator is a source of appreciable noise. In such cases, the design must be made sufficiently liberal to offer the best possible commutation and prevent serious tendency toward high mica. Where freedom from noise is not the major requirement, very hard brushes are preferred for these fractional horse power motors, chiefly as a matter of increasing brush life under the severe electrical conditions encountered. On certain domestic applications, however, brush noise becomes an item of major importance, in which case the softer electro-graphitic grades or graphite brushes of very mild abrasive action and good commutating characteristics are preferred. On fractional horse power motors of the repulsion induction type, where starting torque is a major consideration, the harder brushes with very high contact drop will usually give best results.

Slip-Ring Problems

ON slip-ring applications commutation is not involved and the selection of a brush is simplified to that extent. On rotary converter slip rings, metal graphite brushes have the preference due to their high carrying capacity and low contact drop. On rotaries of relatively small capacity, where there is no serious difficulty in dissipating heat generated at the slip-ring, electro-graphitic brushes are used with good success providing the machines are started from the D. C. side. They are not as successful, however, when machines are started from the A. C. side, due to a tendency of the passage of starting current through the high contact resistance of these brushes to spot the rings. Electro-graphitic brushes being entirely free from abrasive characteristics are not always able to polish off the spotting action encountered at starting, and the effect may become cumulative.

Field rings of alternators and synchronous motors are usually equipped with graphite or electro-graphitic brushes. Most of these rings are of cast iron or steel, and where the machine stands for an appreciable period under the influence of dampness or corrosive fumes the surface of the rings tend to become dull except at those spots where protection is offered by the brush face. When the machine is started a spotty condition of the ring surface is thus encountered which often results in chattering the brushes. Under such conditions, a graphite brush with some polishing action is preferable to an electro-graphitic grade, since it tends to restore the surface of the ring to a uniform polish. On turbo alternators extremely high peripheral speeds are frequently encountered. For this condition graphite brushes of very low specific gravity are preferable since their low inertia permits them to follow more readily any irregularities in the ring surface.

Slip-ring induction motors may be equipped with carbon graphite, graphite, or metal brushes depending on the current densities encountered and the amount of slippage permissible. The higher contact resistance of carbon and graphite grades results in greater slippage than will be experienced with metal graphite grades. Where engineering data are not available to determine the preferable type of brush, selection can be made by observation of the brush with which the machine is originally equipped.

In analyzing the electrical equipment of the average industry it will be found that many unnecessary variations in brush styles, grades, and sizes have become established. The subject of "standardization" of brushes is one which is receiving a great deal of attention at the present time and a committee representing the manufacturers and users of carbon brushes is now working in cooperation with the U. S. Department of Commerce with a view of standardizing brush manufacture to as great an extent as practical limits will permit. It is possible, however, for the electrical department of any plant to accomplish a great deal along this same line by a careful survey of its equipment. Carbon manufacturers are glad to cooperate in efforts of this character, and, in some cases have succeeded in reducing the variety of brush styles carried in the stockroom by a ratio of 10 to 1. This is a service which represents real economy and warrants careful consideration on the part of the electrical engineering staff in all industrial plants.

Maintenance Cannot Be Eliminated

FROM the preceding discussion, it is obvious that there are many conditions entering into the problem of obtaining satisfactory commutation and brush life. The problem of selecting the proper brush becomes an important one, and the electrical manufacturer, who is producing motors and generators and motor driven machinery, must give this problem considerable thought if his equipment is to stand up properly in the field. The things that can and cannot be accomplished by proper selection of carbon brushes must not be confused, however. As was previously pointed out, the machine may have the ideal brushes, but if the commutator surface is not inspected and kept in shape on a regular maintenance schedule, the true worth of the brush and the possibility of cutting down costs with it will not be obtained. Motor and generator commutators should be inspected regularly, the surface cleaned, if necessary, brush tension checked, and every precaution taken to insure easy action of the brushes in the holders.

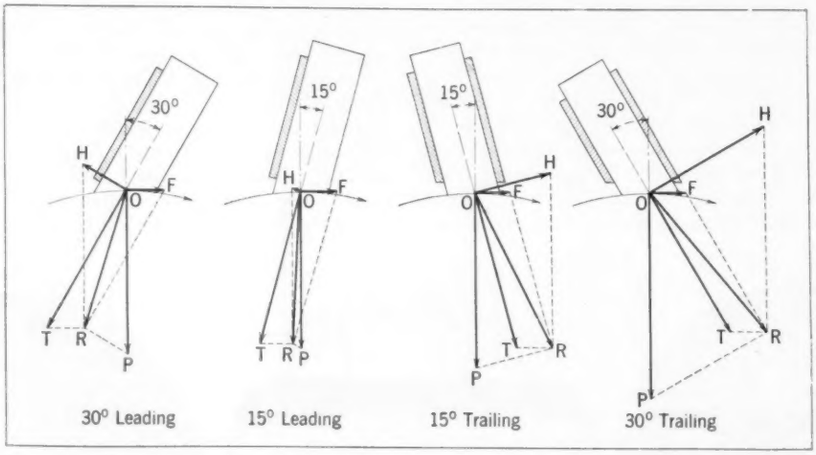
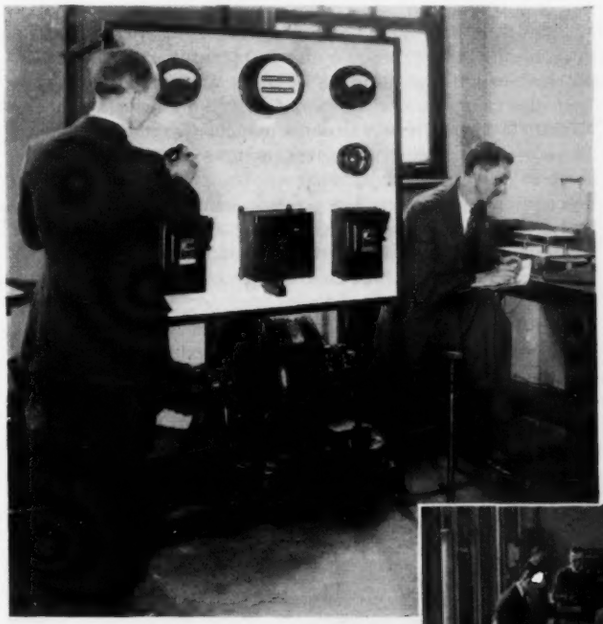


Figure 7. The influence of the brush angle in both leading and trailing positions is shown in the vector diagrams above. For leading operation, the inclination of the holder should be not less than 30 degrees and 15 degrees for trailing operation

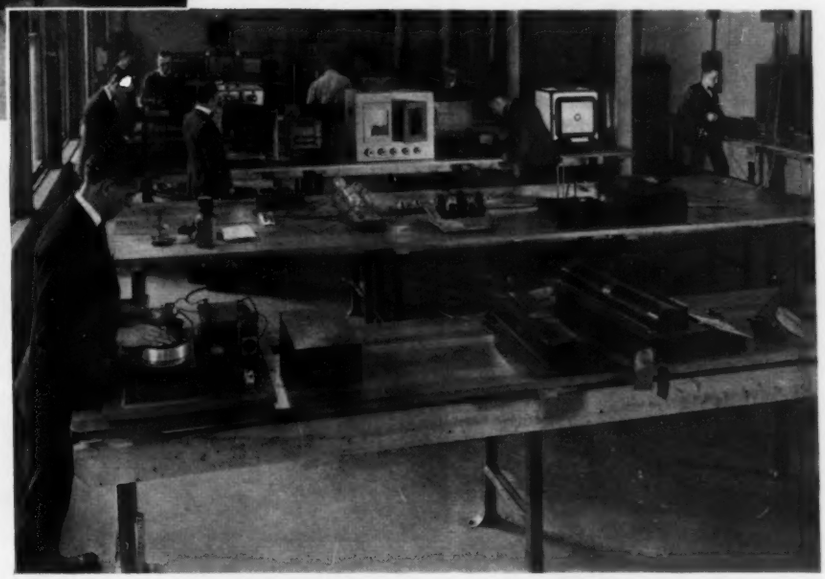
In the selection of the brush all of the operating conditions must be considered and the machine must be studied thoroughly in order that the brushes may perform to the best advantage and keep the cost of maintenance at a minimum. The manufacturer who cannot make these studies in his own plant will do well to cooperate with the manufacturer of the brushes he uses. Conditions which are particularly hard on brushes are thus found and may be corrected at the start rather than after the machines have been placed on the market. The expense of selecting the right brush is, obviously, less if the selection is made at the time the first machines are built. In some cases it will be found that by slight changes in design, commutation troubles, which are difficult, if not impossible to overcome by brush selection, may be removed.

Eliminating Hazards in Electrical Equipment



An outline of the functions and services of Underwriters' Laboratories and the procedure for obtaining its approval of electrical equipment

By William W. Baxter
Associate Editor
Electrical Manufacturing



Above is a view of part of the electrical equipment in the New York offices of the Underwriters' Laboratories, showing some of the devices and materials under test, while at the left is one of the methods for testing heating devices and appliances

UNDERWRITERS' LABORATORIES, a corporation chartered in November, 1901, by the State of Illinois, and now having offices and agencies in most of the important cities of the United States and Canada, occupies a most unique position in the business world of today. Founded and developed as an adjunct to the insurance business, by the National Board of Fire Underwriters, its range of activities has been extended until now the broad general object of the organization is to bring to users the best obtainable opinions as to the merits of all kinds of appliances, devices, machines and materials, with respect to fire, life and collision hazards, and theft and accident prevention.

Such a work is highly commendable if one will but consider the tremendous losses of life and property in this country every year, and too much significance cannot be attached to any institution that has as its aim the seeking of a preventive or a cure in an attempt to reduce these great losses to a minimum. That there is an urgent need for such services as the Underwriters' Laboratories renders is clearly evident when it is considered that the march of progress demands, and scientific and engineering skill are constantly perfecting new developments. Each of these may have in some measure some potential or inherent characteristic that might be detrimental to its use commercially, from the standpoint of safety of life and property and the conservation of our natural resources, and it is in an attempt to find and rectify these that the Underwriters' Laboratories functions. In doing so they render to the world a service that is of far greater value than can be appreciated, and to the manufacturer they give an assistance that he alone can appraise, for no conscientious manufacturer would willingly attempt to market a product or material that would in any way endanger the safety of the life or property of its user.

To accomplish these results Underwriters' Laboratories has three large experimental or testing laboratories, in addition to its many branches and agencies. The chief of these is the home office in Chicago. It is housed in a model three-story and basement building of fire resistive construction, containing about 100,000 square feet of floor space. Another laboratory is located in New York and the third is in San Francisco. Each of these is fitted with the most modern equipment, much of it being designed specially for the purpose for which it is intended. At each laboratory is a staff of trained engineers whose work is divided into departments. Roughly these may be classified as departments of protection, hydraulics, electrical, gases and oils, chemistry, casu-

alty and automotive department and the department of burglary protection. Each functions as a separate unit under one management, thereby reducing materially production and overhead costs.

In the conduct of its investigations the Laboratories has adopted specifications for the testing of almost every conceivable kind of appliance or material. And, that these may be fair to the insurance underwriters and to the manufacturers as well they are compiled from the records of years of experience, in conjunction with committees of manufacturers in their respective fields. As an illustration of the extent to which Underwriters' Laboratories cooperate with industry in general it should be interesting to know that in 1927 some twenty-seven members of the staff of the Laboratories served on 229 committees in thirty-five different national organizations, societies, and conferences, and seventeen of these staff members were the chairmen of their respective committees.

The manner in which the work of examination and test proceeds is briefly as follows: A manufacturer, either upon his own initiative, or at the suggestion of some inspection department or prospective customer applies for examination or test of his product. This may be made directly to the home office in Chicago or to any of the other offices or agencies of the Laboratories. It should contain a fairly complete and comprehensive description of his product so that its character, purpose, size, rating, and any other features may be understood. Such information makes it possible for the Laboratories to classify the product and determine, at least in a general way, the probable nature and extent of the necessary examinations and tests.

An application blank is then forwarded to the submittor with information as to the preliminary fee to be paid for the examinations or tests, with additional instructions as to the character and number of samples that are needed by the Laboratories before its investigations can be started. Upon the return of the application to the Laboratories, accompanied by the fee, the investigations and tests are started at the Laboratories or at an installation of the device or material on as early a date as is compatible with other work already in progress.

A particularly interesting feature of the services of the Laboratories in connection with such tests and investigations, if requested, is that the details of the device sent in for test, the submittor's claims for it and the proposed tests will be discussed with the submittor either by correspondence or in an interview, and an appointment will be made for him to witness the tests if he so desires.

In the case of articles or systems involving a number of structural parts, or where large expense would be incurred for shipment, preliminary reports may be made upon receipt of the fee, accompanied by drawings and a complete description of the article or system. In the event that tests and investigations are necessary at an installation of the submittor's product, these will be made at additional cost for engineer's traveling expenses from and to the nearest office or agency of the Laboratories, or from and to the principal office at Chicago.

In ordinary practice one sample of a large appliance is usually sufficient for test purposes, but in many cases, and especially those covering the smaller devices, various numbers are required, depending entirely on the nature of the tests prescribed for in that particular class of products.

Completion of the test work requires from ten days to six months, all depending upon the test specifications for the class to which the submittor's sample belongs. In the case

Above is shown some of the Underwriters' Laboratories equipment for testing cartridge fuses, and at the left is a cabinet specially built for high voltage testing, in which there is danger to the engineers. In that event the devices are enclosed in the glass case and observations are made from without. These two illustrations are typical of many other arrangements of special equipment for testing almost every kind of electrical device

of appliances not classified, no assurance will be given as to the length of time necessary to complete the tests.

As has been stated, the aim of the founders of Underwriters' Laboratories was to secure the best and fairest opinion regarding the merits or demerits of every device, system, machine, or material, with respect to life and fire hazards, and to have the work so reviewed as to secure accuracy and uniformity in its findings. That this object has been accomplished and the scope of the Laboratories' work so extended may be seen from the fact that the majority of underwriters in the United States, federal, state and municipal authorities, plant operators, architects, and building owners and users either accept or require a report from the Laboratories relative to its recognition of devices, appliances and materials having a bearing on fire, life and collision hazards, as well as theft and accident prevention. But the Laboratories does not guarantee that its findings will be accepted or recognized in any case, as such assurances can only be obtained from the authority having jurisdiction over such matters.

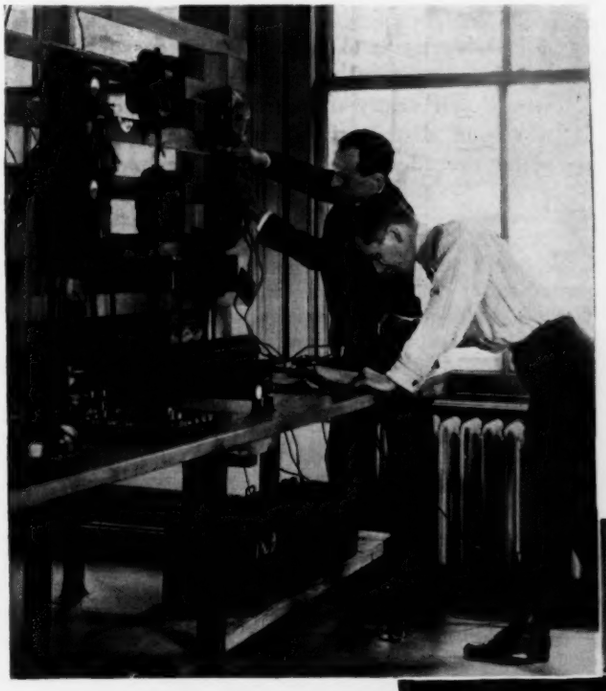
In the event of appeals from or differences with the Laboratories' opinions, there exist permanent arrangements between the Underwriters' Laboratories and the Bureau of Standards of the Department of Commerce of the Federal Government and between the Underwriters' Laboratories and the Department of Mines, of the Department of the Interior, of the Federal Government whereby, in the event of a fixed difference of opinion on a technical matter between the Laboratories and any of its clients, the question at issue may be submitted to either bureau for decision.

Essentially, the organization consists of five councils. These are designated as Fire, Electrical, Casualty, Automotive and Burglary Protection, respectively. Any copies of standards or reports that are submitted to these councils are also filed with the Bureau of Standards of the Department of Commerce at Washington. And if at the conclusion of the work upon any appliance or material the results are such as to warrant its recommendation for the specific use as a standard, a complete report, including the results of the Laboratories' investigations, may be submitted to one or more of the previously mentioned councils, final action and listing of the device or material by the Laboratories being dependent upon a required number of favorable ballots from the members of the council or councils concerned. It is in this manner that the findings of the Laboratories are submitted to the mature judgment of men having wide and varied field experience. On the other hand, if the results of the examinations and tests are such that the Laboratories would not feel justified in recommending it for a listing, a detailed report is made to the submittor only.

At the conclusion of the investigation and of consideration by the council a copy of such report is sent to the submittor, and any number of duplicate reports will be furnished upon request and at the cost of printing. It should be understood, too, that only products produced commercially, and concerning which the actual manufacturer is known, are eligible for listing, but the Laboratories may receive, examine and test devices in the model stage and render to the submittor a report for his information and guidance in future developments.

With respect to the cost of the services of the Underwriters' Laboratories it is manifestly evident that regular subscribers to the Laboratories cannot consistently be called upon to cover the expenses of tests made at the request of others. For this reason a plan has been established whereby a manufacturer desirous of obtaining an examination and report on an appliance or material is enabled to do so by first depositing a nominal fee as evidence of his good faith, and on completion of the work paying the balance of the costs as are shown by accurate records covering the expenses of the tests and examinations. And, to assure an applicant that he will not incur costs beyond his expectations, a limit of expense is fixed wherever possible, beyond which charges

(*Continued on page* 102)



In the illustration above is a group of equipment for testing fire alarm systems, and at the right engineers are shown as they calibrate a circuit before testing cartridge fuses for overload and high temperatures. Much other special equipment is provided in the Laboratories for more extensive tests of fire alarm systems, and as the work shown in the illustration at the right is extremely hazardous it is performed in a small building in the yard of the Chicago Laboratories

Advertising YOUR GOODS *to the*

There are at least a dozen good facturer needs to make use of the the man who sells his

THE notion that the retailer is no more than a cog in the distributing system, and that he functions like a slot machine, is one of the most mischievous fallacies that has ever protruded itself into business. Particularly is this a pernicious doctrine for anyone to spread at this time. Never before has the manufacturer needed the good will of all his dealers as much as he needs it at the present time.

SURPRISING as it may seem, the heretical idea that manufacturers may ignore the distributor when advertising their products has made considerable headway in recent years. The argument is that if consumer advertising creates sufficient demand, the retailer will be forced to handle the product. It is contended that the merchant will carry anything that his customers want and that the way to get him to stock a line is to sell it to his trade. Furthermore, the claim is made that advertising to the distributor is not only futile, but that it is also a waste of time and money, as it detracts from the force and size of the all-important consumer effort.

I will admit the plausibility of these arguments. They contain a certain measure of truth. It is incontestable that the retailer likes to handle articles that are in steady demand. He will do anything within reason to please his customers. He is partial to manufacturers who help him to sell their goods. He will extend himself to cooperate with the manufacturer who rubs his fur the right way. But he cannot be prodded into action or driven to cooperate.

The notion that the retailer is no more than a cog in the distributing system, and that he functions like a slot machine, is one of the most mischievous fallacies that has ever protruded itself into business. Particularly is this a pernicious doctrine for anyone to spread at the present time.

With numerous recent developments revealing the retailer to be by far the most necessary factor in the scheme of distribution, and with chain stores, department stores and other retail organizations becoming more powerful every day, it is time for manufacturers to stop making faces at their distributors. Never before did the manufacturer need the good will of his dealers as badly as he does today.

One of the best ways to win the good will of the retailer, and to get his whole-hearted cooperation, is through business paper advertising. Of course, a manufacturer can get nowhere with the trade unless his dealer policies are sound. But once sound policies have been put in force, there is no better method of capitalizing them and of putting them effectively to work than through the medium of trade advertising.

A mistake commonly made in estimating the value of business paper advertising is judging it entirely on the basis of the orders it produces. To get orders direct from retailers is only one of the many purposes of business paper advertising. If a manufacturer advertised only for orders, the chances are he would be disappointed with the results.

To make such advertising pay, it is necessary to have other objectives, besides the desire for immediate business. That has been conclusively demonstrated by the hundreds of advertisers who are using business papers successfully.

An analysis of the business paper campaigns of these companies reveals that they have twelve purposes principally in view. Those purposes are summarized in the second column on page 65. Let us consider them here:

1. *To get orders.*—More manufacturers advertise in business papers for orders than for any other reason. Perhaps they would not admit that this is their object, but if you could penetrate their thoughts you would find that they have a sneaking hope that their business paper advertising will bring them immediate business. If it doesn't, they give way to disappointment by charging that the "business papers are no good."

¶ Advertising to the seller, a necessary unit in any well-rounded marketing plan, would sell vastly more if it were backed by a strong distributing plan which gives the seller the adequate support he deserves.

THESE critics are not giving business publication advertising a fair shake. While it is possible to make a trade campaign produce a profitable volume of orders, the manufacturer who advertises for no other purpose, or who depends solely on such a campaign, is expecting too much.

A business paper campaign, no matter how good it is, is only one of several necessary units in a well-rounded marketing plan.

To be sure, such advertising, even though unsupported by any other effort, will sell merchandise, but it would sell vastly more if it were backed by a well co-ordinated distributing plan.

Trade advertising, to be fully effective, usually needs the assistance of personal salesmen. Personal salesmen function much more economically when they are assisted by a business paper campaign. Neither trade advertising nor salesmen should be blamed if they fail for lack of support.

Another mistake business paper advertisers often make is expecting their copy to produce results too quickly. It works exactly as does consumer advertising.

If a woman sees a new electrical toaster advertised in a magazine, she does not rush down to a store to buy it right away. In fact, she may not be especially interested in the toaster at first. But after she sees many advertisements in behalf of the toaster. she becomes so familiar with the appliance, particularly with its name, that when she needs a toaster she is likely to ask for or "to accept" the one that she saw advertised.

It is the same with a business paper advertisement. A merchant does not become greatly excited when he sees a new product advertised in his business paper. Gradually, however, as subsequent advertisements for it appear, the retailer begins to "accept" the article. If he should receive a few calls for the advertised product at this stage, he would at least know what his customers were talking about.

Seller in the BUYER'S MARKET

reasons why the electrical manufacturer has proper media to talk regularly to his product to the customer

BY JOHN ALLEN MURPHY
Marketing Counsellor

AT least eleven objectives other than immediate orders are served when the manufacturer advertises to the seller in a buyer's market. The chief objectives are:

1. **To get orders from the retailer.**
2. **To get dealers to send in orders between the visits of salesmen, such as during off seasons.**
3. **To pave the way for salesmen and to make it easier for them to sell.**
4. **To enable salesmen to cover more territory and to make more calls.**
5. **To intensify their efforts and to increase their productiveness per call.**
6. **To help the wholesaler to sell and to support the efforts of manufacturers' agents and other outside representatives.**
7. **To get the advertiser's message before all factors in the buying firm that exert influence in buying.**
8. **To present selling arguments, sales suggestions, advertising plans and display ideas to the trade.**
9. **To advertise special events, such as dealer conventions, a come-to-the-market occasion, or a change in policy.**
10. **To tell dealers about new numbers, additions to the line, fashion changes, and the like.**
11. **To sample a new product to the trade.**
12. **To enthuse the trade, tieing dealers together in one big, loyal family.**

Also, he would know where he could get it for them. If a salesman came around at this juncture, he would receive a much more friendly reception than if the article he is representing had not been advertised to the retailer.

Repetition is the very essence of all advertising, whether it be to the trade or to the consumer. Keep it up long enough and the message it carries will be accepted by the audience to whom it is addressed.

2. *Getting dealers to order between the visits of salesmen.*—Few manufacturers can afford to have a large enough sales organization to cover the retail trade as often as it should be covered. With hand-to-mouth buying in the saddle, the manufacturer of the average fair-selling specialty should have some sort of a representative—a direct salesman, wholesaler's salesman, or manufacturer's agent—call on his dealers every few days.

Since, in most cases, it is obviously impossible to send a personal representative so often, the manufacturer can send an advertising representative instead.

Advertisements placed in the industry's best business papers will keep the manufacturer's proposition before the trade constantly. These advertisements will urge buyers to keep up their stock. They will let them know where they can buy and will keep them from forgetting the line.

¶ A much larger part of the salesman's time could be made productive if the manufacturer paved the way for his call by advertising which acquaints the retailer in advance with the lines the salesman carries.

WE have no better evidence of the importance of this kind of advertising than the fact that in numerous fields of business today, no more than twenty per cent of the retail orders are placed through traveling salesmen. The rest are sent by mail, by telegraph and by telephone. Naturally, the most energetic and most persistent trade advertisers in these fields get these mail and wire orders.

3. *Paving the way for salesmen and making it easier for them to sell.*—Even the most successful salesman spends no more than two hours a day with buyers. The average salesman spends much less. The other four or five hours a day that salesmen work are put in traveling, in trying to get interviews and in cooling their heels waiting for buyers to see them.

A much larger percentage of a salesman's time could be made productive if his house took the trouble to pave the way for his call. This can best be done through business paper advertising.

Through trade advertisements, a manufacturer can make himself and his products known to retailers. Then when his salesmen call on them, they would not have to waste so much time introducing themselves and trying to gain a hearing with the buyer.

A salesman representing an unknown concern usually meets with a cool reception. In most cases, a salesman handing in a card with the name of any good trade advertiser on it, does not have to wait long to tell his story.

4. *Enabling salesmen to cover more territory or to make more calls.*—This use of business paper advertising is intimately tied up with the two previously described uses. It follows that, if salesmen do not have to call on retailers so often, and if they are not obliged to spend time unnecessarily waiting to see buyers, they can cover more territory or make more calls in their old territory.

The most common cause of high distributing costs is

lopsided selling, which results from the failure of the manufacturer to use all the selling instrumentalities that are open to him. He makes one or two agencies or avenues of distribution do all his marketing for him. He overburdens his wholesalers, or his own salesmen.

If he assigned to each factor its proper role in his marketing plan and asked it to do no more than its share, each would help the other, results would be better and selling costs would be lower.

¶ Fine coordination between all selling factors which are involved in a marketing plan is essential, and every recognized sales medium should be used in order to attain the maximum effect.

WHEN we examine any admittedly successful marketing plan, such, for example, as that of the National Lamp Works, we are impressed with the fine co-ordination that exists between all selling factors; every recognized sales medium is being used.

5. *Increasing the productiveness of the salesman's call.*—In many fields salesmen have so many things to sell that it is next to impossible for them to mention each item to the buyer on whom they are calling. At the most, the buyer can give them only a few minutes' time. If they would show their full line, hours would be required.

Salesmen usually solve this difficulty by concentrating on a few specialties or leaders and let the rest take pot-luck.

A number of manufacturers help their salesmen, under circumstances of this kind, by constantly playing up different portions of their line in business paper advertisements. In this manner retailers are gradually acquainted with the line.

Perhaps they become interested in parts of it that the salesmen have been neglecting to show. They ask to see these additional numbers, and thus the salesmen sell larger bills than they would otherwise.

6. *Advertising in business papers to back up the wholesaler.*—This is one of the greatest fields of usefulness for the business paper advertisement. Manufacturers are always complaining about the cooperation they receive from wholesalers. The facts of the matter are that the wholesaler is doing the best he can; he has thousands of items to sell and naturally he cannot permit his salesmen to give much attention to each article. The wholesaler has to sell the things that his customers are asking for; he has no time to do missionary selling.

The manufacturer could help the wholesaler by selling his line to the retail trade. Many companies are doing this by advertising in business papers.

A notable example is the National Carbon Company. This concern sells its batteries and flashlights through wholesalers exclusively. It has no direct contact with its dealers. Its only line of communication with them is through its trade advertising.

This advertising so successfully presents the merits of Eveready products, and why the dealer should handle them, that the wholesaler's salesman doesn't get a chance to forget them when he is booking a customer's order.

That is one of the biggest accomplishments of competent trade advertising—it removes the ordering of the advertised product from the memory and makes it automatic.

7. *Getting the advertiser's message to all buying factors.*—Almost everyone who works in a store today is a buyer, especially all who come in contact with customers. The manufacturer's salesman usually sees only the actual buyer. The manufacturer's trade advertising, if it is properly prepared, reaches all who have buying influence.

It is the custom of all progressive merchants to pass business papers around among their sales people, with the request that they note any articles advertised for which they may be receiving calls or which they think could be sold. A store that didn't follow this practice today would soon find its stock lacking many of the most saleable articles. If there were no other reason for business paper advertising, it would amply justify itself on this score alone.

8. *Presenting ideas and suggestions to the trade.*—A common fault among business paper advertisers is to advertise the product from the consumer viewpoint rather than from the retailer's viewpoint. They tell about the product's qualities, how to use it, etc. That sort of argument does not ordinarily interest the dealer. What he wants to know is how to sell the product, how to display it, how to advertise it and how much money he can make by handling it.

The best trade advertisers invariably take this slant in their business paper copy. There are a number of advertisers in the electrical industry who use this appeal, particularly among the lamp manufacturers. The Corning Glass Works, the Armstrong Cork Company, and Canada Dry Ginger Ale, Inc., are a few other business paper advertisers that always talk the language that the retailer likes to hear—sales, profits, turnover.

Practically every manufacturer could employ this kind of trade copy. It is hard to imagine a company that has not an inexhaustible fund of selling suggestions to pass along to its dealers. There is no better business paper copy than these suggestions.

9. *Advertising special events to dealers.*—Here is another never-failing source of trade advertising copy. Special events are always transpiring in every large business. This makes capital news to relay to dealers.

¶ A good way to announce a new consumer advertising campaign to the trade is to tell about it simply and then explain to dealers how they can tie up their merchandising to the campaign.

THE most frequently used subject of this type is the announcement relating to consumer advertising. Retailers are told that they should stock up heavily because the big campaign that is starting in all the leading magazines will create an unprecedented demand for the advertised product.

Basically, this makes a good subject for dealer advertising. The trouble is that it is overdone and often grossly exaggerated. As a result, retail merchants are now taking the attitude that if the manufacturer's advertising creates such overwhelming demand, they (the retailers) will soon discover it, and that in the meantime it isn't necessary to do so much shouting.

A good way to announce a new consumer advertising campaign to the trade is to tell about it simply and then explain to dealers how they can tie up their merchandising to the consumer drive. Colgate & Company has used this method skillfully in informing grocers about Super Suds.

10. *Telling dealers about changes in line, new products.*—At a time when the fashion appeal has been introduced into almost every line of goods, ranging from ax handles to zinc, and changes are taking place so fast that yesterday's merchandise is passé tomorrow, manufacturers ought to be thankful that there is a medium through which they can announce these changes to their dealers, at least once a month.

The business paper is the only medium that reaches the retailer often enough to get these announcements of product changes to the trade before they are out of date. Catalogs are often too slow. Frequently there are further changes in the line before the new catalog reaches the trade.

In many fields, salesmen are too slow. Their samples

(*Continued on page* 102)

Nema Plans a More Logical Grouping of Divisions for Better Service

Policies Division in meeting at Association Island also discusses cooperation, standard accounting and the sub-standard materials question

A REARRANGEMENT in the divisional structure of the National Electrical Manufacturers Association featured the decisions made by the convention of the Policies Division at Association Island, New York, July 29-August 1. More than 100 leading executives of member companies took action on various subjects, including the use of Nema insignia of quality on manufactured products, the development of proper and standard cost accounting methods in the sections, the elimination of substandard material and fewer association meetings.

Huntington B. Crouse (left), president of the National Electrical Manufacturers Association, and Clarence L. Collens, vice-president, Policies Division, "in conference" at Camp Nema, Association Island

Huntington B. Crouse, president of Nema, pointed out that the association is organized to assist individual groups of manufacturers in working out their problems with the guidance of the best brains in the industry as represented on the board of governors. He stated that the most important subjects affecting the electrical industry are now being given the attention they deserve in Nema, and he urged every executive to cooperate to the limit of his ability.

Following approval by the board of governors and sanction by the Policies Division, the report affecting the regrouping of the association was adopted, subject to the customary ratification by letter ballot. This report made, among others, the following recommendations:

1. Regroup the divisions, with the exception of the Policies and Radio Divisions.

2. Eliminate the divisional vice-presidents, now elected by the divisions, and substitute vice-presidents, not to exceed five, to be elected annually by the board from among its members, for a term of one year.

3. The president of Nema to be the executive head of the Policies Division.

4. Sections having a common interest and being as a group a representative branch of the industry, upon formal request, may be organized into divisions by the board.

Section Council Is Planned

THE second important phase of this regrouping plan deals with the creation of a Section Council, to be composed of all section chairmen and divisional chairmen, with the president of Nema as chairman. At the annual meeting, the Section Council shall elect nine members to the board from its membership, for a period of one year.

The report pointed out that the original divisional idea, obtained from the grouping of the separate organizations into Nema in 1926, no longer represented the most logical grouping.

"The purpose of the Section Council," said the report, "is to promote and coordinate section activities and to develop recommendations to the board regarding section activities."

The direct tie-in, through the new Section Council, between the section chairmen and the board is of fundamental importance. Five of the board members who are also section chairmen will be selected for the executive committee.

The reorganization plan provides that hereafter the annual meeting will be held in the Fall, instead of in the Spring. It was shown that the suggested regrouping of sections made it possible to cut down the number of meetings each year by about one-half. This would save the association more than $300,000 annually by the reduction in time, traveling and other expenses.

Clarence L. Collens, vice-president, made the opening address at the first general session, in which he stressed the need for market and industrial development.

"Meetings of this kind," said Mr. Collens, "are of tremendous importance in creating the mutual confidence and understanding that is essential to our task, which involves, among other things, the development of a group and industry consciousness. We must have frank discussions of conditions, so that we can undertake group action and prepare the individual executive for more constructive effort."

Self-Government by Industry

MR. COLLENS pointed out the desirability of working with the Federal Trade Commission in the line of intelligent self-government by industry, and suggested that the present trend of public opinion was toward a possible revision of the anti-trust law.

Asserting that the accomplishments already on record indicated the tremendous possibilities ahead, President Crouse emphasized the fact that the primary problem of all business, and therefore of groups in industry, is to "increase the return on the investment by efficient management."

The subject of marketing costs was presented at the first general session by Dr. Frank M. Surface, Assistant Director, Department of Commerce. Urging that industry use more facts, he suggested the use of charts and described the

general ways in which the government can be of assistance to business.

"The problem of distribution will be paramount in the future," said Dr. Surface. "Within twenty years an increase of 50 per cent has been made in manufacturing efficiency, and this has been due very largely to the consistent collection of facts. There has been a census of manufacturing since 1840, but we know very little about what happens to goods, once they are produced. There are very few facts available, even today, which give the costs of distribution. Trial and error give us our experience in that field today. We have chain stores, mail-order houses, manufacturers' retail stores and house-to-house canvassing, and they have only one feature in common—the attempt to eliminate one step in distribution."

The Question of Distribution Outlets

DISCUSSING the various forms of distribution outlets, Dr. Surface said that while in some instances an individual might be eliminated, the function to be performed was still present. He denounced the attempt by some manufacturers to sell everybody and get new outlets without regard to their advisability.

E. H. Mehren, vice-president and editorial director of the McGraw-Hill Publishing Company, discussing "The Industrial Market," emphasized many phases of the present fund of sales and distribution cost data and described the need for sales research staffs to stand back of sales managers and salesmen.

These fundamentals of marketing analysis, he said, must take into consideration: that marketing is not yet in the same state of perfection as is production; that more knowledge and data of marketing are available than has been applied; that the marketing program must consist of analysis followed by effective sales administration.

"In your marketing program," said Mr. Mehren, "you must concentrate on groups giving the greatest volume at the lowest sales cost."

The question of sub-standard material and its elimination came up next for discussion, and the use of the Underwriters Laboratories label, supported by a national advertising campaign, was urged by C. P. Berolzheimer.

Following Mr. Berolzheimer's talk, a motion was carried, in the form of a resolution addressed to the board of governors, that a committee be formed, from those section members using the label service, to discuss the problem jointly and report its findings to the board.

The convention also discussed a report, previously submitted to the board and approved by it, which put forward the principle of identifying manufactured products by means of a mark or insignia developed in the various sections where those products meet Nema standards and those of the American Engineering Standards Committee. The purpose of this proposed plan is to serve the public. Listings would be made under a plan of proper test and inspection by an impartial testing laboratory, and must meet with the approval of the board.

Industry coordination, cost accounting and an electrical industry show were the chief topics at the second general session.

A paper on industry cooperation, by W. W. Freeman, president of The Society for Electrical Development, was read by W. E. Sprackling in the absence of Mr. Freeman. This paper outlined the Electrical Industry Sales Conference, described the battle for the consumer's dollar, and urged the need for more cooperation on the part of electrical manufacturers. A motion was made and carried that Nema appoint a committee of ten to cooperate with the S.E.D. and the leagues and report back to the board.

The need of all-industry cooperation as expressed in the organization and activities of the Electrical Industry Sales Conference, was described at Camp Cooperation VIII by W. E. Sprackling, chairman of the conference. The merchandising counsellor appointed by the conference has been busy since early June obtaining the background for a survey, which will present a complete picture of the electrical marketing situation. This survey will be used as the foundation for the formulation of a nation-wide and all-industry plan to sell the electrical idea to the public. The conference will cooperate with the counsellor in selling the cooperative marketing plan to the industry.

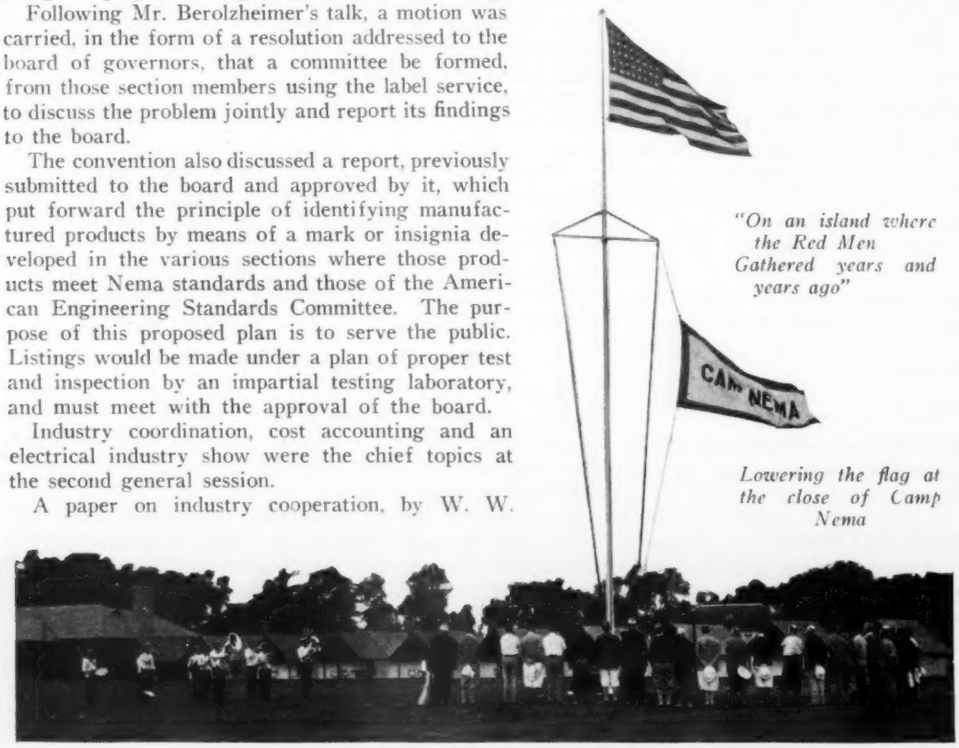
The survey is predicated on a conception of the whole electrical marketing problem as one of giving electrical service in terms of the user, and not in terms of the manufacturer of current, appliances or supplies. The marketing plan will express the idea that the industry's job is not to sell consumers a few convenience outlets, but a 100 per cent electrical service.

The Channels of Distribution

MR. SPRACKLING also discussed the question as to what is and what is not the channel through which to distribute electrical products. Whatever channel or combination of channels is chosen, it should be determined by the buying habits of the public, since it is foolhardy to swim against the current by merchandising through improper channels, when the goal can be reached far more easily and quickly by swimming with the tide of public opinion and habit.

The absolute necessity of starting no cooperative marketing movement which is not designed to be permanent was stressed; it would be disastrous to attempt any "flash-in-the-pan" campaign. By "permanent" Mr. Sprackling meant, not a year, but a period of years; in fact, the cooperative selling plan "should go on forever." That was why the conference had not brought out a plan soon after its organization. The permanency of the effort demanded that the whole problem be studied with great care, so that the plan might be designed for the long haul. To get quick results might mean mistakes. The industry was requested to be patient while the whole plan was being built from the ground up.

The experiences of both the flexible cord section and the molded insulation section in connection with the discussion of cost accounting were studied.



"On an island where the Red Men Gathered years and years ago"

Lowering the flag at the close of Camp Nema

Nema Executives Never Let Jack Become a Dull Boy

"ALL work and no play" no longer makes the executive a dull Jack. As exemplified at Camp Nema, July 29-Aug. 1, where Clarence L. Collens, Nema vice-president, welcomed the Policies Division, which he heads (right), the modern corporation's soul is expressed through its personnel's human contacts in play as well as work

HUNTINGTON B. CROUSE (above), new president of Nema, is rehearsing his talk, "My New Job," with Gerard Swope, who was his predecessor in that high official position

MERRILL W. MORROW, at the left, vice-president in charge of the Nema Appliance Division, just after making a low score

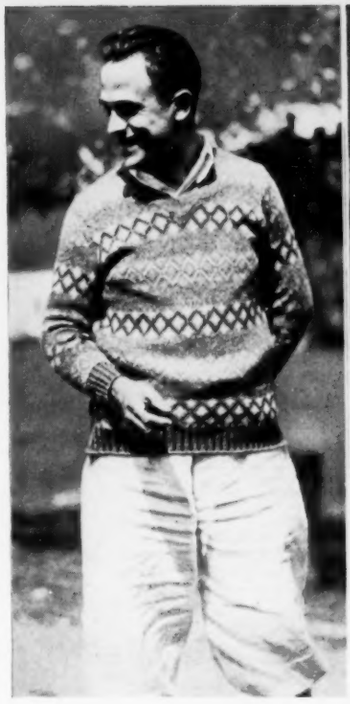
THE president of the Edison Electric Appliance Co., George A. Hughes, is shown above. At the left, G. A. Scoville, Stromberg-Carlson Telephone Mfg. Co.; D. R. Murdock, William J. Murdock Co., and George Eltz, Charles Freshman Radio Co., are looking longingly toward the old swimming hole

GUARD or tackle—it makes no difference to these crouching giants; they play both positions equally well. The cigar belongs to Louis B. F. Raycroft, vice-president in charge of Nema's Radio Division, and his opponent is B. W. Kerr of the Railway and Industrial Engineering Company. Only men in good condition can stoop like this

THIS is Harry B. Kirkland, Camp Nema manager, listening for orders for buttermilk, and listening hard, because he did not have any at the island. And at the right J. L. Ray of the Radio Corporation of America is watching a drive which sailed off miles and miles into the sun—or at least 150 yards, if not somewhat less

WHAT the governor of North Carolina said to the governor of South Carolina was probably nothing compared to what P. B. Postlethwaite (above) is saying to Mr. Bussmann on the opposite page. But the camera man, worse luck, didn't hear it. At any rate, the smiles would indicate that the conversation was a pleasing one

HERE E. R. Harding (left), formerly of the Holtzer-Cabot Company, and A. H. Timmerman, Wagner Electric Corporation, are discussing the prevalence of dry conditions. At the left, the law committee moves to adjourn. Left to right: D. H. Murphy, Wiremold Co.; Alfred E. Waller, managing director of Nema; Silas McClure, Electrical Machinery Manufacturing Co.; Clarence L. Collens; D. R. Bullen, General Electric Co., and Francis E. Neagle, Nema counsel



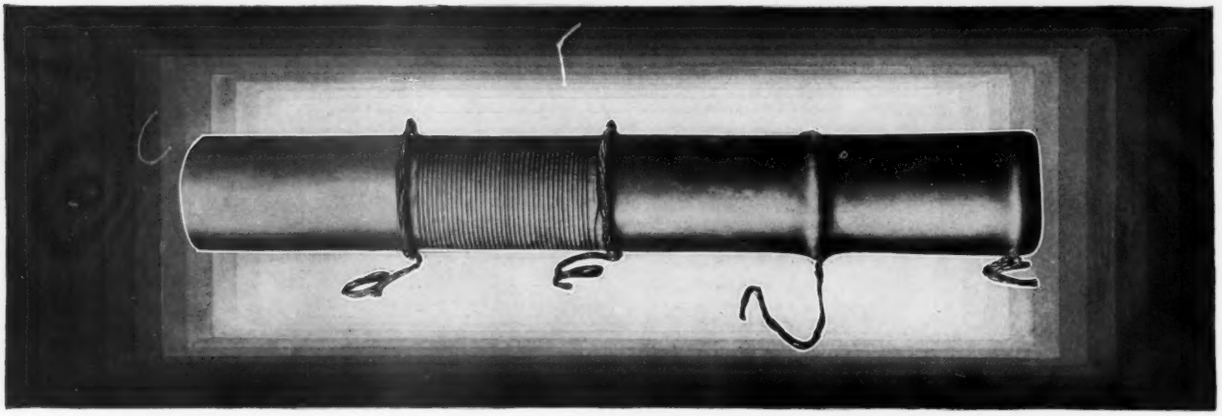
IN front of their tent at Association Island, J. E. McAuliffe (center), Triangle Conduit Company, and I. A. Bennett, National Electrical Products Company, enjoy the latest yarn, while W. E. Sprackling, vice-president in charge of the Supply Division, because he has heard the story before, sits unsmiling but content

THIS smile was bestowed by Harry T. Bussmann, Bussmann Manufacturing Company, upon Mr. Postlethwaite, on the opposite page. And at the right, F. W. Jessop, Ohio Electric & Controller Company, is wearing an arm badge which was understood to mean "Come, my love," or "Carry my line," until the truth was revealed that it merely meant, after all, "Competitors must live"

WHILE they were discussing the overload capacity of high tension switchgear and other apparatus, the camera caught N. J. Conrad (left) and B. W. Kerr, and the above picture shows the result. One thing about taking pictures at Camp Nema—the camera man never had to tell anybody to smile before the picture was "shot"

WHO, after all, is Babe Ruth? C. A. Kurz, Jr., of Kurz-Kash Company, wants to know. Here, to be sure, he is missing a low one, but even the Babe does that now and then. At the right the executives of the electrical industry are about to follow the band to the flagpole for the opening ceremonies at Camp Nema. There is no indication whatever that this is a bread line. White hats were popular, and plus fours prevailed all over Association Island

VITROHM RESISTORS · · · IN EVERY INDUSTRY · · · IN EVERY LAND

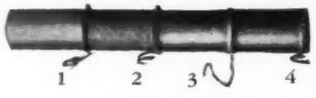


The Vitrohm Resistor

Is a Thoroughly and Accurately Engineered Product

THIRTY-SIX years ago, Ward Leonard Electric Co. placed upon the market the Vitrohm Resistor. This new unit was developed to meet the need for a resistor which would dissipate more energy continuously without deterioration and failure than the types then in use.

The Vitrohm Resistor was made then by winding a resistance wire upon a refractory base. The resistance wire and terminal contacts were coated with fused-on vitreous enamel of special composition. The purpose of the firing and enamelling was fourfold: heating the unit to a temperature in excess of any which would be met in actual service "aged" the wire, thus preventing molecular changes during use; the enamel protected the resistance wire, it conducted the heat rapidly away from the wire to the air, and it increased the effective radiating surface of the resistive element from the area of the wire alone to that of the entire surface of the enamel covering the resistive element.



1. The Vitrohm refractory tube, prior to winding and enamelling.
2. A section of the refractory tube upon which has been wound the special resistance wire.
3-4. Sections wound and enamelled. These sections, if independent of the other two, would now be classed as a Vitrohm (vitreous enamelled) Resistor Unit.

The theory of Vitrohm construction is the same today as it was 36 years ago.

Methods, materials, and production facilities have kept pace with the insistent demands of the electrical industry.

Our research and development department is one of the largest and busiest of Ward Leonard's engineering divisions. Our slogan "36 years of resistor experience" does not designate "static" experience. It means the day-by-day and year-by-year growth of knowledge and skill which is yours with the purchase of a Vitrohm (vitreous enamelled) Resistor Unit.

WARD LEONARD ELECTRIC CO.

MOUNT VERNON, NEW YORK

The MANUFACTURERS' APPROACH to the ARCHITECT

Cooperation in supplying informative trade literature relating to construction work and premarked in accordance with the American Institute of Architects' Standard Classification is one sure method

By William M. Wallace

SELECTING from the markets of the world the materials and devices he fabricates into buildings, the architect, if he is to serve his clients well, must keep posted at all times, not only about all available materials, but also with the experiences of others with them. He must be in a position to familiarize himself with new products as they are developed and at the same time draw conclusions as to their serviceability. He must also be able to judge the relative merits of the different competing products, by reference to records of their performance and by resort to tests.

Such information relating to various materials and different products and their uses and to methods and practices is received by the architect from many different sources. Some of it he obtains from his own experiences and from the experiences of others. Some of it he gets from publications and from reports on experiments and tests. Much of it comes from different standardizing bodies, the Government and from manufacturers' advertising matter. Still more of it is derived from advertising and articles appearing in publications, periodicals and trade literature.

Hence, it is clearly evident that it would be virtually impossible for the human mind to absorb and retain the vast amount of information and data the architect should be able to draw upon quickly and conveniently in solving his daily problems. If the architect were to attempt to read and remember all of this information as it reaches him, he might become a veritable walking encyclopedia, but he would have little remaining time for the practice of his profession. For this reason he finds it necessary to lay this material away for future reference. And in order that it may be readily available, he must file it with some degree of uniformity.

Recognizing this fact some eight or ten years ago, and realizing the difficulties of establishing and installing a consistent system for classifying and filing such a great amount of information as the architect receives daily, the American Institute of Architects began a study of different filing and cataloging methods in common use, in an attempt to find some one system that could readily be adapted to and installed in an architect's office, with a minimum of inconvenience and expense to him. With this in view, many existing classifications and indexing systems, including those known as checking lists, the decimal system, the systems in use in different technical and public libraries and those in use in a number of architects' offices were carefully studied and tested, but they failed to meet one or more of the requirements essential to the classifying and filing of information relating to building construction. This was true for the reason that most of the systems under consideration were, from the architect's standpoint, illogical. They did not, for one reason or another, fit into the general scheme of things in an architect's office. They were entirely out of line with the habit of mind and the train of thought characteristic of the building specification writer. To be made practical, it was found that any of the existing systems would require an elaborate method of cross-indexing, or that a complicated card index would have to be maintained in addition to the files. Obviously, this was impractical. Such a system might be installed at some considerable expense in some of the larger architects' offices, but it would hardly do in the small office, where the individual architect tended to his own filing.

Having arrived at this conclusion, and after further investigation, it was found that the classification and filing systems in use in some architects' offices, inefficient as many of them were, had developed quite naturally in response to office requirements. Some of them were so arranged that the sequence of major divisions was very similar to the sequence of department captions or headings in the well-ordered specification. Generally, they were based on the use of the product rather than the product or material itself. The principal thing was that the variations of the system in different architect's offices were working and they were giving some measure of satisfaction.

It was from this method of indexing and filing that the American Institute of Architects finally evolved what is now established and called the A. I. A. Standard Construction Classification. This standard now includes forty major

AFTER having adopted a few years ago a Standard Classification for Filing, the American Institute of Architects has been urging manufacturers of such equipment and materials as are employed in construction work to cooperate with them by marking their advertising and trade literature with the A. I. A. file number. Many of them are not yet doing this, but they should, because it helps the architect to file catalogs and other informative literature for reference, while it is a matter of little trouble and no cost to the manufacturer.

In order that this Standard Classification for Filing may be better understood by manufacturers it is described in the accompanying article, together with some recommendations by the Institute as to the size, type and contents of advertising matter and other literature sent to them by manufacturers.

If for no other reason than that of learning of the advantages of the filing system adopted by the A. I. A. the article should be of interest, while that section treating of what the architect wants in the way of catalogs and advertising matter should be more than significant.

THE EDITOR.

divisions, ranging from the preparation of the site for a building to the landscaping of the grounds after completion of the work. And, in turn, each of the major divisions is again sub-divided into many minor or sub-divisions as are required under the different headings of the classification.

In A. I. A. Document No. 172, which is descriptive of the standard classification and contains a list of all the major and sub-divisions, it is stated that the broad purpose back of the classification is to simplify filing in the architect's office to the point where an adequate file can be maintained and operated conveniently by a person without technical knowledge, and where the maintenance of such a file is within the means of every architect from the largest, who can afford an experienced file clerk, to the one who does his own filing.

In planning this classification an attempt was made to reconcile, in so far as was possible, the architect's need for a rather fine division of subject matter in the files and the present practice and inclination on the part of the manufacturer to include in one catalog information on his entire line of products.

Eventually, however, the classification was drawn up and adopted by the American Institute of Architects, but even then they found themselves in a rather peculiar situation. They had no available funds for exploiting the classification. There was no argument they could advance to encourage its use, other than it was better than most of the other systems in use. Manufacturers were not printing the file numbers on their literature, and for a time it appeared that it was purely a matter of choice whether the system was adopted or not. But, in the first year after the classification had been adopted by the Institute, some fifty or more architects had adopted and installed it with some measure of success. In that same year several manufacturers who had learned of the classification began to mark their literature with the proper file numbers. Now the use of the classification is quite general and large numbers of manufacturers are cooperating with the architects by premarking their catalogs and other printed matter so that it can easily be placed in its proper place in the files.

¶ The use of the A.I.A. standard classification and the cooperation of the manufacturer in premarking his literature have many advantages for both the architect and the the maker of various materials.

IT should be understood that the standard classification is by no means a commercial enterprise. No fees or charges are made to either the architect or the manufacturer in connection with its use, while printing the A. I. A. standard file number on a piece of literature or advertising matter does not necessarily imply that it will be filed by the architect, nor does it imply any approval by the Institute of either the manufacturer or his product. It is merely a matter of cooperation on the part of the manufacturer to assist the architect in the use of manufacturers' catalogs and advertising matter, should he have a need to use such literature for reference purposes.

As can be readily seen, the use of the classification and the cooperation of the manufacturer in premarking his literature have many advantages for both the architect and the maker or vendor of various materials and devices. The classification provides the architect with valuable information that is always available and within easy reach when he wants it, and it insures the manufacturer that his catalog or advertising will receive due consideration, provided, of course, that it contains such information as is of value to architects.

After the classification had been in use for several years it was found that the electrical division (No. 31 in the classification) was not arranged chronologically and that it did not contain in some of its sub-divisions all of the materials and equipment with which the average architect has to deal. For this reason the National Electrical Manufacturers Association, in conjunction with members of the American Institute of Architects, began a study of the electrical classification, with a view to incorporating in it and rearranging its contents to include such additional materials and devices as they thought should be of value to the architect. This work has finally been completed, and in its present form (that appearing elsewhere in these pages) has been approved by the National Electric Manufacturers Association and adopted by the Association of Electragists, International.

¶ The value to the architect of informative literature and its reciprocal value to the manufacturer depends upon the extent to which it aids the architect in making an intelligent selection of materials.

AS the electrical division of the classification now stands it includes 13 major sections. These, in turn, are divided into 62 sub-divisions and 107 minor sections. In this wide variety of listings are to be found practically every conceivable kind and type of material or electrical equipment any architect would have occasion to use in construction work.

It should be understood, in connection with the standard classification, that the value to the architect of technically informative advertising and other literature, and its reciprocal value to the manufacturer, depends upon the extent to which it aids the architect in making an intelligent selection and utilization of products and methods employed in construction. And according to A. I. A. Document No. 184 the value to the architect of such literature depends very largely upon the following requirements: First, it should present the facts that an architect is likely to require. When possible, helpful diagrams and tabulations should be supplied. When tests have been made, especially by disinterested authorities, reports of such tests and unbiased conclusions should be included. All claims for materials or devices should be supported by proofs. Drawings of parts, or the whole, and drawings showing methods of installation should be reproduced accurately at an indicated scale and should frequently be dimensioned. If available, information as to the probable improper use of the product should be given, for, as is clearly evident, architects should not be compelled to obtain such information through embarrassing and at times costly experience. When materials are made in several grades or classes, complete descriptions and explanations of recommended uses of each grade should be supplied, as architects frequently have occasion to use materials other than the highest and most expensive grades. In this respect it should be understood that the names of architects who have used the product or illustrations of buildings of architectural merit in connection with which the product has been used may sometimes be of interest, but they are not conclusive evidence of quality. The value of information of this character may be enhanced by describing the extent to which the architects referred to have used the product, the extent to which and how the product was used in the buildings illustrated, and by reports of surveys on the service that has been rendered and on the present condition. The name and address of the architect of each building illustrated should always be given. And of particular significance is the fact that overloading informational trade literature with illustrations of buildings may tend to invite its destruction, since for illustrations of modern buildings architects depend largely upon the plates published in architectural magazines. The use of the product by architects, not known to be of wide experience, and the use of the product in connection with buildings of little or no architectural merit is of little, if any, interest or value.

All statements should be as brief and to the point as adequate presentation of the subject will permit. Clarity, however, should not be sacrificed for brevity. The advertiser should keep in mind that much informational material must go into the architect's file, and increased bulk means increased cost of filing equipment.

The title of the publication should clearly indicate its true character. Trade names and classes or kinds of materials or appliances described should be given, as well as the name of the manufacturer, and where practical the addresses of his branch houses and representatives. General and evasive titles and incomplete information, designed apparently to pique the curiosity of the architect, seldom arouse interest and usually imply lack of reference value. Decision as to whether a given piece of trade literature is to be filed or discarded is usually made during business hours when time for satisfying idle curiosity is not available.

The arrangement of the subject matter should be such as to facilitate reference. Elaborate and extravagant statements, irrelevant matter, and testimonials from persons not especially qualified to pass judgment are useless and stimulate unfavorable reaction on the part of the architect.

Advertising matter should be attractive enough to capture the architect's attention and obtain a reading, but at the same time should be simple and businesslike. Illustrations of the product and of its uses should establish some proper association in the architect's mind between the product and the character of work in which it is used, and they should not offend good taste. Heavy, ornate and expensive covers add nothing to the reference value of a publication, occupy valuable space in the file, and therefore, invite destruction.

The advertiser should encourage and facilitate the preservation of advertising matter by the architect by complying with the recommendations as to size, classification of subject matter, and indexing made by the American Institute of Architects. One of the conditions that contributes to the difficulty of filing advertising matter, whether it is properly indexed or not, is wide variations in size. It is highly desirable that a standard size be recognized that will readily lend itself to filing in the standard vertical filing equipments now generally in use, and, at the same time, provide for the greatest possible economy in the use of paper. The Institute, therefore, recommends that advertisers adopt 8½ by 11 in. as a maximum and 7½ by 10⅝ in. as a minimum size for all publications intended to be filed in filing cabinets. No objection is made to these sizes being folded once and then being saddle stitched so as to open flat in the file.

If folders are supplied for trade literature it is preferable that they be standard letter size folders (9⅜ by 11¾ in.). It is further recommended that the folder tab extend entirely across the folder in order to provide ample space for the file number, the name of the manufacturer, and the name of the material or appliance described in the literature. If the cover of the publication is intended to serve the double purpose of a folder and a cover, its height should be the standard folder height (9⅜ in.). Its length, however, may vary from 10⅝ to 11¾ in. according to the size of the publication to be inclosed.

No recommendation is made for the size of handbooks to be carried in the pocket or for bound volumes to be placed upon shelves. The Institute, however, recommends that manufacturers who make a practice of publishing a single catalog comprising products for widely dissimilar uses, consider the possibility of increasing the usefulness of their advertising by publishing in place of one catalog a number of booklets of standard size, each dealing with a single major subject as listed under the standard classification.

As a precaution against error and the misplacing of the material in the file, the advertiser should obtain the correct file number for each piece of advertising from the Structural Service Department of the American Institute of Architects, 19 West 44th Street, New York City. This file number should preferably be printed near the lower right hand corner and the upper left hand corner of the front cover of a bound publication, or in a similar position on the face of a single sheet. If folders are provided, the file number should be placed on the tab and on each separate enclosure. The inscription should be as follows:

"A. I. A. File Number————"

The style and size of type proper to use will depend, in some instances, on the character of the cover. As a general guide, however, it is suggested that "A. I. A. File Number" be printed in about 9-point type and the number assigned in about 14-point bold faced type. The file number should be clearly discernible.

The Institute urgently requests that all pieces of advertising literature be dated in a prominent place. Architects then know whether the information is sufficiently recent to warrant its acceptance without question, or whether they should apply to the manufacturer for a later publication. If a new publication supersedes any previous publication this fact should be clearly noted.

Electrical Section of the American Institute of Architects Standard Classification for Filing as Recently Approved

The electrical section of the Institute's classification is as follows:

¶ Sub-divisions indicated by a star (*) have not been changed in the original listing of the classification.

¶ Numbers shown in parentheses are the original numbers of the classification and have been changed to the numbers immediately preceding sub-titles.

¶ Sub-divisions not otherwise indicated are new and have been added to make the Electrical Section of the classification complete.

¶ All information as to the classification and the methods for premarking literature, as well as the correct numbers for each division should be obtained from the Structural Service Department of the American Institute of Architects, 19 West 44th St., New York City.

31. ELECTRICAL*

31a Generating and Converting Apparatus*
- 31a1 General Engineering Data*
- 31a2 Generators
  - 31a21 Turbine Generators
  - 31a22 Engine-Driven Generators
- 31a3 Motor-Generator Sets
- 31a4 Converters
- 31a5 Rectifiers (For Radio See 31i6)
- 31a6 Generating Plants for Special Service (31f28)
  - 31a61 Small Light and Power Plants
  - 31a62 Battery Charging Equipment
- 31a7 Batteries (31f28)
  - 31a71 Primary (Wet and Dry)
  - 31a72 Secondary (Storage)

31b Transformers*
- 31b1 General Engineering Data
- 31b2 Power
- 31b3 Distribution
- 31b4 Instrument
- 31b5 Bell-Ringing (31i12)
- 31b9 Other Transformers and Auxiliaries.

31c Distribution and Transmission Systems*
- 31c1 General Engineering Data*
  - 31c11 Red Seal Plan
- 31c2 Pole-Line Systems
  - 31c21 Poles, Towers and Cross Arms
  - 31c22 Pole-Line Hardware

31c23 Insulators
31c29 Other Pole-Line Materials
31c3 Manholes and Transformer Vaults (31c55)
31c4 Regulators
31c41 Induction Voltage-Regulators
31c42 Constant-Current Regulators
31c49 Other Types
31c5 Condensers, Capacitors
31c51 Synchronous Condensers
31c52 Static Condensers
31c59 Other Apparatus for Improving Power Factor
31c6 Wiring*
31c61 General Data and Specifications
31c62 Metallic Conduit, Tubings and Raceways (31c51)
31c63 Non-Metallic Conduit Tubings and Raceways (31c51)
31c64 Boxes, Fittings and Supports (31c52, 31c53, 31c54)
31c65 Knobs and Tubes
31c66 Bus-bars and Fittings
31c67 Wires, Cables and Cord (31c61)
31c671 Rubber and Varnished-Cambric Covered Wire
31c672 Slow-burning and Asbestos-Covered Wire
31c673 Weather-proof Wire
31c674 Armored Cable
31c675 Non-Metallic Sheathed Cable
31c676 Lead-covered Wire and Cable
31c677 Cord
31c679 Other Wires and Cables
31c7 Wiring Devices*
31c71 Receptacles (31c72) Sockets* and Switches (31c73) (See also 31d4)
31c72 Floor Boxes and Fan Hangers
31c79 Other Wiring Devices (31c74)

31d Switching and Protective Equipment
31d1 General Engineering Data
31d2 Switchboards (31c2)
31d21 Power and Lighting Switchboards
31d22 Theatre Switchboards
31d26 Switchboard Materials and Fittings (31c33)
31d29 Other types of Switchboards
31d3 Panelboards, Cutout Bases and Cabinets (31c3, 31c31, 31c32) (For Materials and Fittings See 31d26)
31d4 Switches and Circuit-Breakers (31c4) (For Wiring Device Switches See 31c71)
31d41 Knife Switches
31d42 Safety Enclosed Switches
31d43 Disconnecting Switches
31d44 Air Circuit Breakers (31c42)
31d45 Oil circuit-breakers and Oil Switches (31c42)
31d49 Other Types of Switches
31d5 Relays and Relay Protective Systems (31c43)
31d6 Fuses and Thermal Cutouts (31c41)
31d7 Grounding and Grounding Devices
31d8 Lightning Rods and Arresters (31b)
31d9 Other Switching and Protective Equipment

31e Electric Measuring and Testing Equipment* (for Instrument Transformers see 31b4)
31e1 General Engineering Data
31e2 Indicating Instruments (Ammeters, Voltmeters, Frequency Meters and Watt Meters, etc.)
31e3 Watthour Meters
31e4 Recording or Graphic Instruments
31e5 Testing Equipments
31e6 Electric Thermometers and Pyrometers (Thermocouples)
31e9 Other Instruments

31f Illumination*
31f1 Illuminating Engineering Data*
31f11 Outdoor*
31f12 Residential*
31f13 Industrial*
31f14 Commercial* (Stores, Offices, Banks, etc.)
31f15
31f16 Educational Buildings* (Schools, Libraries, Museums, etc.)
31f17 Public Buildings* (Auditoriums, Churches, Theatres, etc.)
31f18 Institutions (Hospitals, Asylums, etc.)
31f19 Other* (31f18)
31f2 Lighting Equipment*
31f21 Lamps* (For Portable Lamps, etc., See 31f231)
31f22 Outdoor Standards and Brackets
31f23 Indoor Fixtures and Portables
31f231 Residential
31f232 Commercial
31f233 Industrial
31f234 Auditorium-Type
31f237 Reflectors, Shades and Glassware (31f22)
31f239 Other
31f24 Floodlights*
31f25 Stage-lighting Equipment
31f26 Airport
31f27 Signs*
31f29 Other (31f25, 31f26, 31f29)

31g Motors and Controllers (21d) (For Sound Insulation, See 37d)
31g1 General Engineering Data
31g2 Motors (31d1, 31d11, 31d12)
31g21 Single-phase Alternating Current
31g22 Polyphase Alternating-Current
31g23 Direct-Current
31g29 Specific Applications (Sub-title as needed)
31g3 Controllers (31d2)
31g31 Alternating-Current
31g311 Manual
31g312 Magnetic
31g32 Direct-Current
31g321 Manual
31g322 Magnetic
31g33 Rheostats and Resistors
31g39 Other Types
31g4 Brakes

31h Motor-Driven Equipment*
31h01 General Engineering Data*
31h1 Laundry Equipment* (Portable) (For Stationary Laundry Equipment See 35d)
31h2 Kitchen Equipment* (For Refrigerators See 32c3)
31h3 Pumps and Compressors* (For Fire Pumps See 29e4; See also 29d5 and 30e5)
31h31 Water*
31h32 Gasoline*
31h33 Oil*
31h34 Air and Gas*
31h39Other
31h4 Portable Vacuum Cleaners (31h41) (For Stationary Vacuum cleaners See 35j1)
31h5 Portable and Ceiling Fans (31h42) (For Stationary fans and blowers See 31d1)
31h9 Other (31h43, 31h44, 31h45)

31i Signalling and Communicating System*
31i01 General Engineering Data
31i1 Call Systems*
31i11 Speaking Tubes
31i12 Code Call
31i13 Bells* Buzzers* Annunciators* Push-Buttons (35i14)
31i14 Letter Boxes (For non-electrical See 35h1)
31i2 Time Systems*
31i21 Time Recorders and Stamps*
31i22 Watchmen's Time Detectors*
32i23 Electrical Clocks
31i3 Alarms*
31i31 Fire*
31i32 Burglar*
31i33 Police
31i39 Other
31i4 Signals
31i41 Hospital
31i42 Telautographs (31i4)
31i43 Equipment Protection
31i49 Other
31i5 Telephones* (For Booths See 16e63)
31i51 Intercommunicating
31i52 Switchboard
31i521 Manual
31i522 Automatic
31i6 Radio and Television*
31i61 Receivers
31i62 Parts and Accessories
31i63 Television
31i7 Public Address Systems
31i9 (Sources of Energy. See also 31a3, 31a7, 31b5)

31j Electro-Medical Apparatus*
31j1 Sterilization of Water (31k1)

31k Electric Heating and Cooking Apparatus (31g)
31k1 General Engineering Data (31g1, 31g2)
31k2 Furnaces and Ovens (31g5)
31k3 Space and Radiant Heaters (31g31)
31k4 Commercial Cooking (31g4)
31k5 Domestic Cooking (31g4)
31k9 Other (31g32, 31g33)

31m Electric Welding and Apparatus
31z General Catalogs.

* *The revised electrical section of the Standard Construction Classification for Filing, adopted by the American Institute of Architects and approved by the National Electrical Manufacturers Association and the Association of Electragists International.*

Adequate TARIFF LEGISLATION for the Electrical Industry

Proposed changes in present laws deserve attention of all electrical manufacturers

BY A. E. WALLER

Managing Director, National Electrical Manufacturers Association

THE need for prompt and constructive action along definite lines with a view to securing adequate tariff legislation is highly important to the electrical industry at this time. The present tariff law, enacted in 1922, will be revised by Congress at its next session, and it is suggested that all manufacturers move to have specific schedules covering the various lines of products put into the new bill.

From the best available sources of information, it is understood that an attempt will be made to cut the protective tariff about 25 per cent and to change certain of the administrative features. If such changes are effected it will have a very serious effect on the electrical industry.

It will be recalled that among the principal objectives of the tariff law are the following:

(1) To protect infant industries. There are only a few branches of the electrical industry proper that come within this classification. It is evident, however, that proper protection of all the industries of the country is of direct and immediate interest to the electrical industry, since the application of electricity and the use of electrical apparatus and supplies extend into every industry, and for this reason any legislation that works a hardship on any industry in the country must have a detrimental effect upon the electrical industry.

(2) Another objective is to maintain the high standards of living now established in the United States.

(3) The tariff is also useful for trading purposes on export business. Most foreign countries use the protective tariff for the purpose of securing a preferred decision in foreign markets.

(4) In addition to the indirect interest of the electrical industry and the other industries of the country, there is a very definite direct interest. The United States is the largest consumer of electrical apparatus and supplies in the world, and Germany and other countries are casting envious eyes on our market and will try through importers

A. E. Waller

to get tariff revisions in both the rates and administrative sections, enabling them to take a much greater amount of business than has been possible heretofore.

The import of electrical devices has been greatly increasing over a term of years, as clearly indicated in a photostat table prepared by the Department of Commerce and sent out in May of this year. This compilation tells part of the story but not all. It shows the direct imports of electrical apparatus, supplies and radio, insofar as these are obtainable, but it does not take into account a large and increasing influx of electrical materials that are now brought in under circumstances which render their segregation and listing virtually impossible.

Most electrical apparatus and supplies now come under either Paragraph 399, which is known as the "Catch-All Clause," including articles made of iron, steel, copper, brass, etc., not specifically indicated under other classifications, or Paragraph 372, "Machinery or Parts thereof not otherwise specifically provided for." Due to certain administrative features, the actual operation of the law is quite unsatisfactory to electrical manufacturers. The Customs Court of Claims has the power to adjudicate in certain matters and to determine certain definitions not clearly stated in the bill. The Court has in the past indicated that certain articles may be regarded as "parts of machines" and this court has also described as "machines" such items as circuit breakers, and in consequence, porcelain insulators are imported as "parts of machines," 30 per cent ad valorem, instead of coming in under the "Porcelain Clause," 70 per cent ad valorem. Magnetos are being imported as "parts of machines" with 25 per cent duty instead of being classified as electric machines under Paragraph 372—30 per cent or Paragraph 399—40 per cent. This is because magnetos are supposedly parts of automobiles, or in the tariff parlance, parts of machines. It is well known, however, that at least a large part of the magnetos imported are used not in automobiles, but in a variety of applications.

The tariff levied on "parts of machines" is only a fraction of the tariff levied on electrical imports, brought in under other paragraphs with lower duties.

Therefore, if the electrical industry wants proper protection, it must move to have specific schedules covering the different lines of electrical products put into the new bill. This requires that immediate action be taken for the following reasons: the actual work of redrafting the bill will occur during the early part of next year; it will be based on recommendations made by the Ways and Means Committee of Congress. This committee will meet in December of this year to prepare its recommendations. These recommendations will be based upon conclusions that the Ways and Means Committee may draw after holding hearings at which time electrical manufacturers can present the facts regarding actual labor and material cost here and abroad, of those lines of electrical apparatus and supplies upon which special schedules are desired. These facts should show the effect lower foreign wages have upon the reduction of foreign costs.

Characteristics That Determine the *Selection* of MOTORS

No. 3 of a Series Discussing Motors of Different Types

Several special types of synchronous motors have been developed to overcome the inherent disadvantages of the ordinary synchronous motor

BY THEODORE SCHOU
Consulting Engineer, Fairbanks, Morse & Co.

AND

C. P. ROBINSON
Synchronous Engineer Ideal Electric & Mfg. Co.

THE following article describes some of the special types of synchronous motors and treats briefly the control problems encountered in the application of synchronous motors. The first two articles also described synchronous motors, and appeared in the June and July issues of ELECTRICAL MANUFACTURING.

The clutch type synchronous motor. Applicable to similar loads as the super-synchronous motor, but of entirely different principle of construction, is the magnetic clutch type synchronous motor, manufactured by the Westinghouse Electric & Mfg. Company. In this case a built-in magnetic clutch forms the mechanical link or connection with the load and the rotor, which during the starting period revolves free on the shaft in auxiliary roller bearings between the rotor spider and the shaft. After the rotor has attained synchronous speed, the magnetic clutch is energized and thus the driven half of the clutch, which

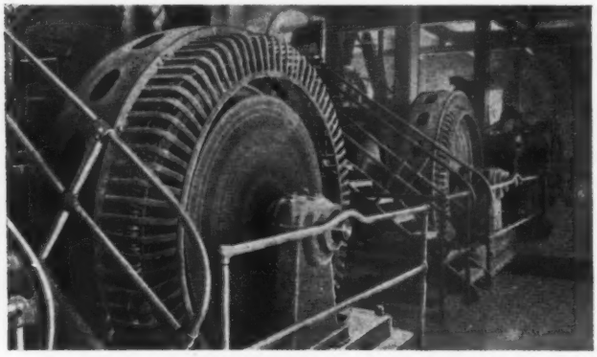


Fig. 35. The clutch type synchronous motor stars the rotor first, then by means of a clutch the load is brought up to speed. An installation of these motors is shown above

is rigidly connected to the shaft and load, is brought up to synchronous speed. Opening of the magnetic clutch immediately transforms the motor to a rotary condenser, which feature is of interest with this type of motor. Fig. 35 shows a clutch type synchronous motor installation.

Rotating armature, definite or salient pole construction. This type of construction is used for smaller synchronous motors in ratings from 5 to 50 hp. and 900 to 1800 r.p.m. Motors of this class may be designed for separate or self-excitation and they have similar starting characteristics as the standard rotating field type. As the armature is rotating, slip rings are necessary, and such motors are therefore limited to a terminal voltage of 440 volts. They adapt themselves from an economical standpoint to smaller synchronous drives, both belted or coupled. Fig.

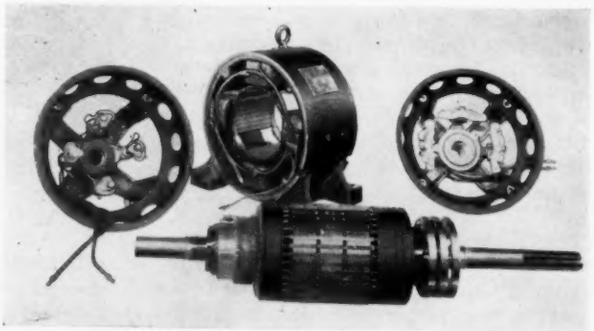


Fig. 36. Smaller synchronous motors of 5 to 50 hp., 900 to 1800 r.p.m. use the rotating armature, definite or salient pole construction shown in an exploded view above

36 shows an exploded and Fig. 37 an assembled view of self-excited rotating armature type synchronous motor.

The Fynn-Weichsel motor: self-excited.

This most interesting type of synchronous motor, developed by the Wagner Electric Company, is built in ratings from 5 to 200 hp. and speeds from 514 to 1800 r.p.m., with terminal voltage up to 550 volts. The Fynn-Weichsel motor is in a class by itself, being a rotating armature, non-salient pole construction and possesses unique starting and running characteristics. This type of motor starts as a slip-ring type induction motor developing 150 per cent torque with starting current of from 150 to 200 per cent. With a corresponding increase in starting current it will develop up to 250 per cent starting torque. The pull-in torque is identical with the pull-out torque it possesses as a synchronous motor—approximately 150 per cent. Loaded above this value, the motor will not stall, as is the case with the conventional type of synchronous motor, but will continue to operate as an induction motor with a pull-out torque of approximately 250 per cent. If the load drops off to 150 per cent of normal, the motor pulls into step and operates again as synchronous motor. The Fynn-Weichsel synchronous

motor therefore combines all the favorable and desirable characteristics of both the slip ring induction motor and the synchronous motor and yet has none of their objectionable features. Although of rather recent origin, this

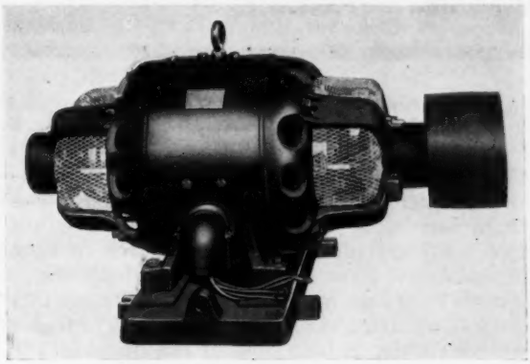


Fig. 37. The rotating armature definite or salient pole motors are designed for self or separate excitation and have similar starting characteristics to the rotating field type

type of synchronous motor has well established itself for drives necessitating its characteristics. Fig. 38 shows a Fynn-Weichsel synchronous motor installation.

Synchronous Motor Control

The matter of control is very diversified, due to the many conditions of operation met with in the field, and also due to the preferences of the various manufacturers. However, all types of control have the same ends in view: to provide means for starting and synchronizing the motor; to protect the motor under all conditions of operation; and to protect the operator.

Synchronous motor control is divided into two main classes: hand operated control and automatic control.

Fig. 38. The Fynn-Weichsel motor starts as an induction motor, pulls into synchronism. Above 150 per cent torque it runs as an induction motor instead of stopping as do synchronous motors

Each of these divisions may also be considered from the standpoints of full voltage starting and reduced voltage starting.

The full voltage automatic push button type of starter is perhaps the most commonly used. This type is used where the current inrush drawn from the line is not in excess of the power company's requirements. Above such limits, the reduced voltage starting panel is used.

The standard equipment on a full voltage automatic panel consists of a main line switch with low voltage and overload protection, synchronizing relay and field switch with discharge clip which short circuits the synchronous motor field through a field discharge resistance during the starting period. The main line switch is usually air break for low voltage, normal amperage, and oil break for low voltage, high amperage, and high voltage. On high voltage panels, it is usually necessary to provide a control circuit transformer. On low voltage panels the control circuit voltage is the line voltage. In no case is high voltage ever brought to the face of the panel. Fig. 39 illustrates a typical full voltage automatic starting panel.

The sequence of operation of this type of panel is as follows: Pushing the start button either actuates directly the magnet closing the main line switch or actuates a small master contactor, which causes the main line switch to close, impressing full voltage on the motor. At the same time, the remaining relays are energized. When the motor has accelerated to nearly synchronous speed, the synchronizing relays, either frequency type, time delay, or a combination of time delay and current limit, act, and cause the D.C. field excitation to be applied, which pulls the motor into synchronism. Automatic pressure gauges, or float switches are sometimes used instead of push buttons.

In the case of the reduced voltage automatic panel, the sequence of operation is the same, except that an additional relay is provided to transfer the circuit from re-

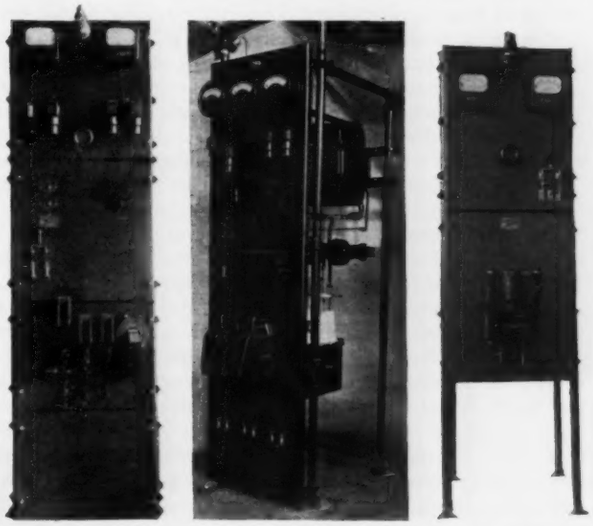


Fig. 39 *Fig. 40* *Fig. 41*

Fig. 39. A typical full voltage automatic starting panel. Fig. 40. A reduced voltage full-automatic starting panel. Fig. 41. A hand operated reduced voltage panel for synchronous motors

duced voltage to full voltage; a double throw main line switch is used, and an auto transformer or other means of obtaining reduced voltage is provided. Fig. 40 illustrates a reduced voltage full automatic panel. Fig. 41 a hand operated reduced voltage panel.

The hand operated panels of both types obtain the same sequence of operation except that the relays are omitted, and the operation is entirely manual. In some cases, variations of these are used, such as a hand operated main line switch used with an automatic field switch.

Motors with no external field excitation, such as the Fynn-Weichsel motor and the self-excited synchronous motor, require simply a hand operated compensator.

The meters supplied with the standard panels usually consist only of an A.C. ammeter and a D.C. ammeter. Other meters are supplied according to the customer's preference and are considered as extras.

The types of protection furnished on the panels of different manufacturers vary somewhat, but not in the essentials. In general, it may be said that any panel should protect against:

1.—A.C. voltage failure.
2.—D.C. voltage failure.
3.—Overload.
4.—Motor staying on starting period too long.
5.—Damage due to single phase operation.
6.—High voltage injuring operator.

Station G-A-G-E, Editor Speaking

Stanley A. Dennis, Editor and Assistant to the President

Advertising Puts on Its Thinking Cap

ADVERTISING executives seem to be in a rather thoughtful mood these days. And that fact is a pleasant and a promising sign, for out of their thinking surely will come newer points of view and a better understanding of the ways in which advertising may be employed as a business-building force nowadays when sales do not come as readily and as easily as they did some time ago.

Something of a jolt was given to the advertising world at the recent convention of the International Advertisers Association at Detroit when Dr. Hollis Godfrey declared that through a survey made by the Engineering-Economics Foundation, of which he is president, he had found that much, very much, of the present-day advertising is keyed to a seller's market rather than to the existing buyer's market and that this fact alone accounts for unsatisfactory returns from many of the leading forms of advertising in use today. Apparently advertising executives and copy writers have not yet learned how to use advertising in a buyer's market, despite the fact that the seller's market disappeared some six years ago. It is interesting to note that this survey, made on the initiative of the Foundation and therefore free of any outside influence, revealed the important part which the business press has played in the growth of wealth in the United States and that the business press suffered only slightly in the first three months of 1928 in contrast with newspaper, popular magazine, outdoor, and direct mail advertising. Dr. Godfrey's message to the advertising world is published elsewhere in this issue of ELECTRICAL MANUFACTURING, pages 54 to 56.

In this connection it should also be pointed out that the oft-repeated admonition to "lump your advertising appropriation in consumer publications in a buyer's market" may after all express a fallacy rather than a sound bit of business philosophy. Business history reveals many instances of the unhappy results of neglecting the seller in planning an advertising campaign in the buyer's market, and much history of this kind has been written in recent years. What the editor hopes will prove to be a helpful discussion of this subject appears in the article by John Allen Murphy in this issue of ELECTRICAL MANUFACTURING, pages 64 to 66.

Nema Sets a Good Example

UNDER a reorganization plan sanctioned by the Policies Division of the National Electrical Manufacturers Association at their recent convention at Camp Nema, Association Island, and approved by the Board of Governors, the association shifts its annual meeting from spring to autumn. And under the regrouping of the divisions it becomes possible to cut down the number of meetings each year by about one-half. It is expected that this change, and others, will save the association membership more than $300,000 annually in the reduction of time, traveling, and other expenses.

Certainly this is a step in the right direction, and one that should commend itself to the attention of other associations in the industry. Each year the activities of the various associations seem to increase steadily in cost and the time has come to curb this charge against the industry's business wherever and whenever possible without sacrificing the effectiveness of association work and its final value to the organized groups in the electrical field. During the present year the conflict of conventions, especially during May and June, has served to spotlight the heavy cost of association work and to prompt many executives to ask themselves, and others, what can be done about it. It is not surprising that many complaints have been heard recently to the effect that the industry is overburdened with associations. Much is to be said, of course, on both sides of this question, but the time does seem to have arrived when all associations should, if possible, follow the example set by Nema.

Frequently the comment has been heard that The Society for Electrical Development, as the "forum of the industry," should tackle the problem of "too many meetings and too many conflicting convention dates," and take the initiative in bringing order out of chaos. Just how far the society could go in such an effort no one can say, but under the right kind of leadership it should certainly be able to improve the present condition.

Reaching the Architect

EVER since the electrical industry outgrew its swaddling clothes, manufacturers of electrical products have knocked long and hard on the door of the architect's office, seeking to reach therein the man who specified various forms of electrical service and the equipment necessary to that service. Not always has this knocking been successful. Indeed, manufacturers have repeatedly complained that the architect has been indifferent, that he has sought refuge behind a locked door, or that he would not give a fair hearing to the manufacturer's message. Unquestionably there has been much ground for this complaint, but at the same time it must be remembered that the manufacturer himself has often been to blame for his failure to win a hearing. Too often he has failed to study the problem from the architect's point of view and has persisted in seeing things only from his own point of view. Too often the manufacturer's printed message has failed to tell the architect the very things that he wanted to know. And, to be more specific, manufacturers have in general failed to identify their own catalogs, booklets, and letters in a way to encourage the architect to keep them at hand for instant use. For years architects have maintained a filing system for such material, and yet that system has escaped the serious attention of scores, perhaps hundreds of manufacturers. Recently this classification has been revised, and the new classification has made adequate provision for the filing of electrical literature. An entire section has been given over to electrical equipment and provided with sufficient sub-classifications to permit the manufacturer to identify his sales and instructional literature in such a way as to obtain correct filing and thereby increase the possibility of use by the architect. Every manufacturer should find it worth while to consider the suggestions made on this subject by the American Institute of Architects and especially to identify his printed messages in the way recommended by that organization.

Manufacturers Tighten Their Purse Strings

"MILKING the manufacturers" seems about to become a thing of the past in the electrical industry. For a long time, and increasingly so in the last five or six years, it has been the practice for local electrical organizations of various kinds to solicit subscriptions from manufacturers located anywhere and everywhere for the support of purely local activities. Time and again the solicitation has come in such form that the manufacturer hesitated to refuse it, and more than one solicitation has been little else than a club in scant disguise. The evil has long been recognized, but what to do about it has been the difficult question.

Now, however, the solution, or the way to one, is likely to be found, and to be found by cooperation. At the recent meeting of the Policies Division of the National Electrical Manufacturers Association at Association Island, a committee was appointed to study this matter and to find some way, if possible, of placing manufacturers' support of local work on an equitable basis, one just to the manufacturer himself and to the local organization also. The trend of thinking on this subject is to let the character and value of the local work determine in large measure the amount of manufacturer support that it shall receive and then to distribute this support as fairly as possible among the interested manufacturers. What agency shall serve as the clearing house for such support is yet to be determined. The effort of Nema in this direction deserves the approval and support of the industry as a whole.

During recent years there has developed a feeling that the manufacturers' support should go chiefly to national activities and that the central stations should be looked to for the larger measure of support for local electrical development work. In general, this point of view may be expected to prevail in the future. At any rate, the manufacturers are justified in taking defensive measures, and measures which at the same time are constructive.

Losses from Bad Mailing Lists

SOME day, "in the sweet bye and bye," perhaps, the electrical industry may wake up to the possibility of eliminating waste in many of its practices and methods. And if that day ever comes, it will be discovered that the losses to manufacturers in woefully inaccurate mailing lists run into staggering figures. And when these losses are totaled for a period of years, perhaps the manufacturers will be stirred up sufficiently to take action to put their mailing lists on a profitable basis.

It is the habitual practice, of course, to take the point of view, "Oh, what's a stamp, more or less?" And therein lies the trap that has caught countless thousands of dollars. In sticking to that point of view, consciously or unconsciously, the manufacturer, or sales manager, or advertising manager, reveals his failure to remember that a small leak can sink a great ship. Experts in maintaining lists for direct mail purposes know how heavy with inaccuraces are many, almost all, of the supposedly perfect lists that come to their attention. And yet too many executives have failed to realize that when the multiplication table gets in its deadly work on lists that remain inaccurate over long periods of time the losses are heavy indeed. Some day perhaps, the electrical manufacturing industry will pick up its morning newspaper and discover that such and such a concern has failed, "largely because of losses in its direct mail advertising effort." And if that happens, it may be that electrical manufacturers will give serious and productive thought to this "small leak."

Indeed, one may hope that the day will come when even the Postoffice Department will undertake to cut down its annual deficit by setting up some kind of machinery within its own organization to eliminate the cost of handling mail erroneously addressed and therefore undeliverable and also the cost of handling a multiplicity of copies of the same mailing sent to the same address under a variety of names or to the same name at a variety of addresses. Rabbits have been given high honors for their ability to multiply, but perhaps the first prize belongs to inaccurate mailing lists, when one considers their astounding ability to multiply losses at every opportunity.

Aviation and the Manufacturer

DESPITE all the talk about production outrunning consumption these days, new markets seem to be opening up before the manufacturer in a most encouraging way. And despite all the hue and cry about saturation in this or that market, a completely saturated market is yet to be discovered. One of the new markets facing the electrical manufacturer is found in the steady development of aviation. Despite all the heart-breaking tragedies of attempted oceanic flights, aviation will continue to develop in the United States and Canada, and ultimately it will equal and probably outstrip the development of aviation in Europe. It becomes a matter of importance, therefore, to the electrical manufacturer of the future to begin now to know more about this great coming market.

Just what does the growth of aviation in the United States and Canada mean to the electrical industry? Nobody knows the answer yet. But it is becoming apparent that aviation should mean much to the industry. For one thing, it should mean the development of a great, new market for illumination and illumination equipment. Airports must be illuminated. Airlanes between airports must be lighted by beacons and signs. Both demand a highly specialized kind of illumination. Progress has been made in developing this illumination, but there is still much to be learned. New methods, new principles must be discovered. Better equipment must be designed and marketed. Airport buildings must be equipped for light, heat and power in order to render adequate electrical service to the air vehicles themselves. Electrical equipment for installation on the airplanes must be improved and new kinds developed.

So much is more or less taken for granted. But that is not all of the story. The growth of aviation means the development of vast areas now undeveloped, but lying directly in the line of air traffic, and located where airplanes form natural terminals or junction points for the embarking or discharge or transfer of passengers or freight. Just as the railroad and the steamship developed vast areas of the national territory, so the airplane may be expected to develop territory heretofore out of the line of land or water transportation.

Foreseeing what is certain to come during the next decade, an editorial writer on a New York newspaper was prompted recently to make the following statement:

"Thousands of people on their way to and from Europe will change airplanes on Staten Island. Just as the old floating ships built up Manhattan Island, so flying ships will build up Staten Island."

Electrical central stations in increasing number will be called upon to draw up airport lighting plans, to specify the necessary kind of lighting equipment, and to render electrical service as required. Electrical contractors must expect to be called upon to install airport electrical equipment and to service electrical equipment on airplanes and in airport buildings. The time has come for the electrical industry to take aviation seriously.

TIME PAYMENT

If instalment sales are based on can afford to neglect their use, petition of other industries for

By H.
Vice-President, Credit

H. B. Lewis

DURING the period in which its use was spreading most rapidly—from 1912 to 1926, to be exact—a considerable hue and cry was raised against instalment selling in certain quarters. It was piling up a mountain of personal debt, we were told. It was mortgaging the consumer's future to such a degree that the first severe unsettlement of the economic balance would send the whole structure tumbling down about our ears. The finance companies were parasites, usurers, and what not.

All this was quite an impressive sobfest while it lasted. But times have changed. The defense has been heard. Facts and figures have been adduced. Bankers, economists and officers of the Federal Government have expressed themselves with a favorable bias on instalment selling as seen from their respective points of view, and today its economic value is virtually unquestioned among progressive business men, who indorse it almost unanimously as a principle and only stipulate that it shall hold to sound practices in its modus operandi.

The consideration overlooked by the former critics of installment selling is the vital part played by the down payment and the equal monthly payments of the balance.

When they heard of a billion dollars' worth of goods being sold on time in a year they regarded it as a billion outstanding, with ten or twelve months to run; whereas, in fact, a billion dollars' worth of new automobiles sold on time, according to the usual terms, would mean but approximately $337,502,000 outstanding at the year's end, with an average maturity of only 5½ months.

The Percentage of Time Sales

THE former critics of instalment selling exaggerated the percentage of sales made on time. It is usual to be told that 80 or 90 per cent of all motor cars are sold on time, whereas the best figures available show an average not exceeding 64 per cent. I have never talked to a dealer whose figures ran as high as that. The monthly reports of the Federal Reserve Bank of Chicago show that the percentages of time sales during the past two years have varied between 34.2 and 49.3 per cent, and have at no time exceeded the latter. The average for 1927 as computed by the National Association of Finance Companies is 60.8 per cent.

The average new passenger car down payment is 33⅓ per cent, and the average term for the balance is ten months. When, as in 1927, the passenger car output figures at the retail price some three billion dollars, and the used car sales volume approximately one-third of that sum, it means that at the end of the year's sales there will be outstanding only some $860,872,500, or approximately 46 per cent of the total deferred payments, and but 30.6 per cent of the total time sales. Four months later, if time sales stopped at that point, this total would be down to $328,694,800, or 17½ per cent of the total deferred payments, 11.6 per cent of the total time sales and 8 per cent of the total passenger car sales of the industry as calculated above.

When Instalments Reduce Hazards

THE ten weekly payment plan for selling men's clothing reduced the outstandings of the merchants who used it from 25 per cent of sales as they were under the old open account system to 8 per cent. The cash down payment and the regular weekly payments of the balance actually reduced the dealer's hazard appreciably.

The factors that have made instalment selling safe are:

1. A sufficient down payment to give the buyer a sense of ownership and to penalize him heavily in case of default.
2. A sufficiently rapid rate of payment for the balance to build up his equity to complete ownership and decrease the seller's equity to nothing faster than the resale market value of the merchandise depreciates.
3. The title retaining instrument on which the goods are sold, which makes complete forfeiture the penalty of delinquency at any stage of the contract.
4. The careful credit work of the well established finance companies.
5. Their alert but discriminating collection work.
6. The spread of risk among thousands or millions of buyers, depending on the industry under consideration. There is no concentrated hazard nor any condition approaching a frozen inventory in the instalment sales picture.

It is through a realization of these facts and the emphasis laid upon them by leading economists, bankers, such national figures as President Coolidge, Vice-President Dawes, Secretaries Mellon and Hoover, and other authorities whose impartial viewpoint has given their expressions the weight due to absolute sincerity and a high sense of responsibility, that the unreasoning opposition to this form of merchandising has been allayed, and the finance companies, without whose specialized service instalment sales on their present scale would be impossible, have at last gained the recognition to which they are entitled as economic factors of the utmost importance. Unless they themselves impair that prestige by adopting unsound tactics—and the trend is all the other way today—instalment selling is not likely to be questioned henceforth by responsible people. It is interesting to note that

Selling Plans *Must Be Sound*

sound principles, no industry because they strengthen the com- a share of the consumer's dollar

B. LEWIS
Commercial Company

THE author of this article recommends the following as a sound instalment selling plan for adoption by manufacturers:

1. **A 25 per cent down payment.**
2. **A maximum of 12 months (ten months preferred) for paying the balance in equal, non-interest bearing monthly instalments.**
3. **Paper to bear the full endorsement of the dealer.**
4. **A factory repurchase agreement to give the plan widest effect at the lowest practicable rate.**
5. **Payment of 90 per cent of the face of the note to the dealer at date of purchase, the remaining ten per cent to be paid him immediately upon liquidation of the transaction.**
6. **Collections to be made by the finance company rather than by the dealer.**
7. **Fire and theft protection for the buyer and conversion protection for the dealer, if desired, at a slightly higher than standard rate.**

the history of automobile production speaks for itself as to the influence of instalment selling upon merchandise of high unit value. In 1913, when the principle had been in limited use for barely a year, American passenger car output was 461,500 units. In 1925, after twelve years of instalment selling, output was 3,696,490 units. John J. Raskob, chairman of the finance committee of the General Motors Corporation, has said of instalment sales:

"If this credit were not available, we would have no motor industry as we know it in this country today."

In these days of vertical competition no industry can afford to neglect any fine points of the merchandising art of which competing industries are making capital. When you estimate the consumer's dollar at from seventy billion to ninety billion per annum, it sounds elastic. But when you reckon up the potential output of all those industries that are competing for a share of that dollar and witness the intense nature of that competition today, you quickly realize that no industry can lose step with the procession without falling rapidly behind.

In considering the advantages of quoting a time price on all instalment-sold merchandise unless the cash price is specifically requested, it is important to realize that this method averts controversy over the finance charge. Not that I advocate for a minute backing away from any issue raised on that point. But any finance charge that figures out as more than the bank rate of interest will be questioned now and then by some conscientious objectors; and why raise the issue if it can be averted?

It is, however, important that every salesman who handles instalment-sold goods realize that the charges of a finance company are not interested at all, but the price of a service.

Anyone who compares finance company net earnings with those of successful manufacturers or merchants will see that their rates entail no undue profit margin, being, in fact, favorably comparable with many merchandise prices that go unquestioned. The automobile buyer who pays a $70 rate for his financing gets a car worth from $300 to $500 more than the cash buyer of a generation back, *thanks solely to the economics of mass production*, made possible, as Mr. Raskob has told us, by the selling stimulus of instalments.

Safety Factors Vitally Important

NO instalment selling plan should be constructed purely for its sales appeal without due recognition of the factors of safety which must be embodied in any program that is to prove workable over the long swing. Only by unsound concessions in that direction can the present strong and durable instalment structure be undermined. No finance company with a sense of responsibility toward its fellows and the business community at large, or toward its own stockholders will offer such a plan.

Some measure of factory participation in the liability is desirable in connection with any factory-sponsored plan for radio instalment sales, because the finance company, to give service that is truly national in range, must necessarily extend its facilities to some weak dealers. The proportion of such has been high, but is shrinking somewhat; but it is still sufficiently high to eliminate a considerable percentage of the dealers of any factory from its finance plan unless the factory participates to some extent in the liability.

In the event of a dealer's default, any sets repossessed by the finance company, without such factory participation, would necessarily be sold in the open market for whatever they might bring—probably very little, since finance companies do not qualify as radio merchandisers—with harmful effect on the market in general and on that manufacturer's market in particular, and with detrimental effect on the profits of the finance company.

It is obvious that, as a measure of self protection, the finance company, without factory liability, could only accept business from carefully selected dealers, which would necessarily exclude many from the plan, especially those in the more remote sections where a national plan would be of particular value.

The form of factory participation that is simplest and would probably prove most workable and effective is a repurchase agreement whereby the factory agrees to take off the finance company's hands any sets it is obliged to repossess because of the dealer's inability to cover his endorsement, or because of the buyer's inability to pay out on contracts issued by a dealer who has failed since they were entered into.

Experience teaches that a plan whereby the finance com-

(*Continued on page* 100)

Facts, Figures and Trends

Statistical information of value to electrical manufacturers in working out policies and plans for production and marketing

Russian Conditions

It is estimated that electrical equipment valued at 472,000,000 rubles will be required in Russia to carry out the five year plan of that country. At present there are seven Russian plants manufacturing electrical machinery, but the demand exceeds the productive capacity of these companies. For this reason, Russia is dependent on importing a large quantity of electrical apparatus. For the year 1926-27 the imports amounted to 45 per cent of the total equipment which was required.

British Market

As the result of recent legislation passed in Great Britain, the electric generating plants of that country are going to be brought together into one huge superpower system. It is expected that this development will greatly increase the use of electricity both in industry and in the home. This in turn will create a greater demand for electrical apparatus of all kinds. Although the British industry practically controls the business in heavy equipment, there promises to be an open field for competition in high grade apparatus.

Refrigeration in Chile

The Department of Commerce reports that during the year 1927 electric refrigeration sets, up to one-ton capacity and valued at $21,620, were exported from the United States to Chile, and during the first five months of 1928 some $6,178 worth of these units have been purchased by that country.

Like many other countries, Chile has been slow in recognizing the necessity of providing cold storage and refrigerating facilities necessary for the handling and marketing of perishable products. In Santiago, which has a population of upward of half a million people, there are but seven ice plants with a daily capacity of 116 tons.

Hydroelectric Power

Three records in the production of electrical energy by water power were established in May, according to the United States Geological Survey. More electricity was generated in one month than ever before, the total being 3,178,749,000 kw-hr. The average daily rate of production, 105,958,000 kw-hr., was the highest on record. The proportion of the country's total production of current generated by water power was the largest, having risen to more than 44 per cent. The yearly average is about 35 per cent.

More than 2,700,000 tons of coal would have been needed to generate the electricity produced in May, it is said.

The French Market

In France the excess of electrical exports over imports increased from 200 tons, valued at 50,000,000 francs in 1921, to 20,000 tons, valued at 390,000,000 francs in 1926. Figures show, since 1921, a regular decrease of imports in weight and an increase in value; and an increase of exports in both weight and value, reaching 630,000,000 francs, against 34,000,000 francs in 1913. The French electrical equipment manufacturing industry in 1913 capitalized at 300,000,000 francs, produced 60,000 tons of material, valued at nearly 200,000,000 francs. In 1926, production of electrical equipment exceeded 4,000,000,000 francs on an invested capital of about 2,500,000,000 francs.

South African Conditions

In South Africa in January 107 electric cooking stoves were connected to the power mains, as compared with 125 in December, 1927, and 129 in November, 1927. The falling off in January was probably due to its being the holiday season and to the abnormal demands on the householders' purses in the early part of the year. In January 44 water heaters and 12 electrical refrigerators were also installed. These appliances are gaining in popularity.

Conditions in Switzerland

American electrical apparatus is being undersold by native made equipment in Switzerland. Despite this, the American apparatus is of such quality that it is finding favor, and there are substantial sales in the following American manufactured electrical equipment: vacuum cleaners, percolators, toasters, fans, clothes washers, refrigerators, floor polishers and waffle irons.

Quarterly Exports

During the first quarter of 1928 the United States exported electrical apparatus and machinery to the value of $20,896,000, which represents 1.8 per cent of the total value of domestic exports for that period. For the first three months of 1927 the electrical exports amounted to $19,663,000. Thus the first quarter's electrical exports for 1928 show a gain of 6.3 per cent over those for the similar period in 1927.

Power Pump Sales

During the first five months of 1928, the sales of power pumps were: 1591 in January; 1598 in February; 2578 in March; 2299 in April; and 2305 in May. The total for the five months was 10,371 as compared with 3921 for the same period of time in 1927 and 13,058 for the entire year of 1927.

Radio Jobber Trade

The annual business of the radio jobber in the United States averages about $218,000. The highest average amount of business done by jobbers in various geographic groups was reported by those in New York, New Jersey and Pennsylvania, where the average was $298,000. New England jobbers came next with an average annual business of $264,000. The jobbers in the Great Lakes region averaged $245,000 annually. In Kentucky, Tennessee, Alabama and Mississippi the lowest average amount of trade was reported, the figure being $118,000.

Radio Survey

A Federal Radio Commission survey shows that the distribution of radio receiving sets in various sections of the country closely parallels that of motor cars. The estimated number of receiving sets is 12,000,000, and there are 19,237,171 automobiles in the United States. Approximately 7,500,000 of the radio sets are standard receiving units with loud speaker volume, the others being crystal and one tube receivers. The survey also shows that the number of sets in use in various sections of the country corresponds much more closely with the number of income taxes paid than with the population figures of those districts.

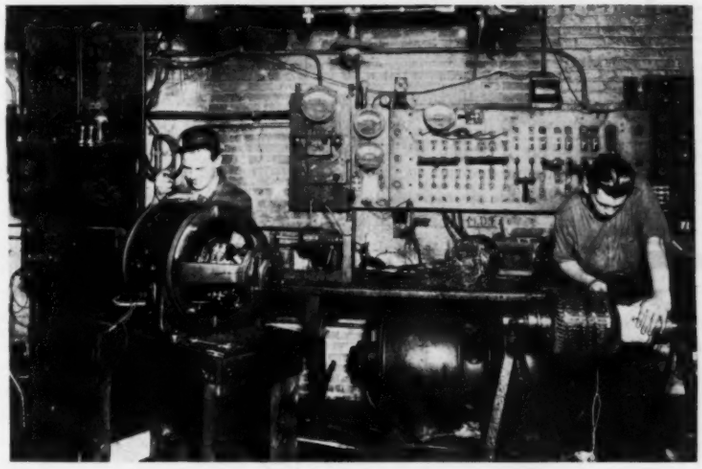
Copper Market

The 1927 consumption of copper in the United States was 834,550 tons, over half of which was put to electrical usage, the electrical manufacturers alone using 196,500 tons. The 1927 world production of copper was 1,674,818 short tons of which 847,419 were produced in the United States. During that year the United States copper imports were: ore and blister, 303,754 tons; refined in ingots, bars, etc., 51,640 tons; in manufactures, 29 tons; scrap, 3738 tons; total, 359,161 tons. Corresponding copper exports were: ore and blister, 3618 tons; refined in ingots, bars, etc., 461,233 tons; in manufactures, 77,289 tons; scrap, 22,709 tons; total, 564,849 tons.

Lead Figures

The United States lead consumption in 1927 was 840,950 tons of which 175,000 tons were used in the manufacture of electric storage batteries. The United States produced 673,000 tons of lead in 1927, the world total being 1,856,441 tons. The United States imported lead as follows in 1927: ore and matte, 40,638 tons; bullion or base bullion, 118,284 tons; pigs and bars, 2467 tons; type metal and antimonial lead, 326 tons; total, 161,715 tons.

Overhead an Important Factor in REPAIR SHOP Operation



The Thompson-Bonney Company, of Brooklyn, N. Y., has an interesting method of recording production costs and determining overhead expense

BY WILLIAM MELVIN

THIRTY-THREE years in business as one of the leading electrical equipment and motor repair shops in Brooklyn, N. Y., records, in brief, the success of the Thompson-Bonney Company, achieved, as William J. Lauth, vice-president of the company, says, "because we have the facilities and the skilled workmen with which to undertake any kind of electrical repair work; we know exactly the production cost of every job that passes through our shop, and we can determine our overhead to a fraction of a cent at any time."

Mr. Lauth is proud of the fact that he knows the production costs and overhead of the Thompson-Bonney Company, and frequently in discussing the business he refers to this fact. "It is essential to the business," he says, "that we should know them, and it is possible for us to do so because of the simple system of accounting we follow."

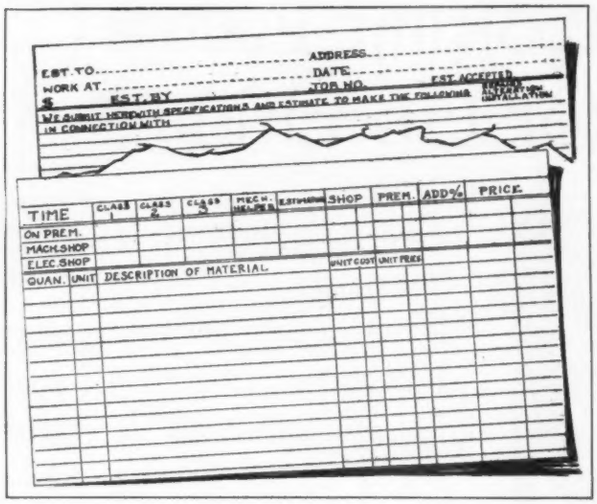
To the layman, or even to the experienced motor repair shop owner, the fact that the Thompson-Bonney Company does know its costs and overhead might leave the impression that it must require an elaborate set of books. This, however, is not true in this case. All that is required is three books and a few forms for cost-keeping records, which will be discussed later.

Thompson-Bonney really started in business in 1895 under the name of Baecholdt & Parker, with Charles A. Thompson, an interested member of that organization, but the business was not taken over entirely by Mr. Thompson until 1897, while John F. Bonney, an engineer by training, did not join Mr. Thompson until 1898. These two men carried on the business of the original company until 1902, when a new organization was formed and regularly incorporated under the name of the Thompson-Bonney Company. And, although Mr. Thompson and Mr. Bonney are now both deceased, the business is still being conducted under the incorporated name of the company by the widow of John F. Bonney, Mrs. M. D. Bonney, her two sons, W. V. Bonney and John F. Bonney, and an uncle of the boys, William J. Lauth, who, as has been stated, is vice-president of the company; Mrs. Bonney being president, W. V. Bonney treasurer, and John F. Bonney secretary.

Essentially, the company is equipped to undertake almost any kind of electrical repair work, although the present principal business is that of repairing motors, generators, and other similar equipment. This work is done in the shop of the company at 142 Pearl Street, Brooklyn. The shop is housed in a two-story brick building at that address, the first floor being used for extremely heavy work, while the second floor is used for lighter jobs and for the offices of the company.

Of particular significance, too, and odd as it may appear in this day, when practically every enterprise depends almost entirely upon salesmen and advertising for its business,

The illustration at the top of this page is a view of one corner of the Thompson-Bonney Company motor repair shop in Brooklyn, N. Y. The workmen are repairing armatures and testing finished motors, while the alternating current generator and the control panels are shown in the background. Above is a view of one corner of the machine shop, showing but a small part of the machine tool equipment


EST. TO..... ADDRESS.....
WORK AT..... DATE.....
$ EST. BY..... JOB NO. EST. ACCEPTED
WE SUBMIT HEREWITH SPECIFICATIONS AND ESTIMATE TO MAKE THE FOLLOWING IN CONNECTION WITH

TIME	CLASS 1	CLASS 2	CLASS 3	MECH. HELPER	ESTIMATOR	SHOP	PREM.	ADD%	PRICE
ON PREM.									
MACH. SHOP									
ELEC. SHOP									

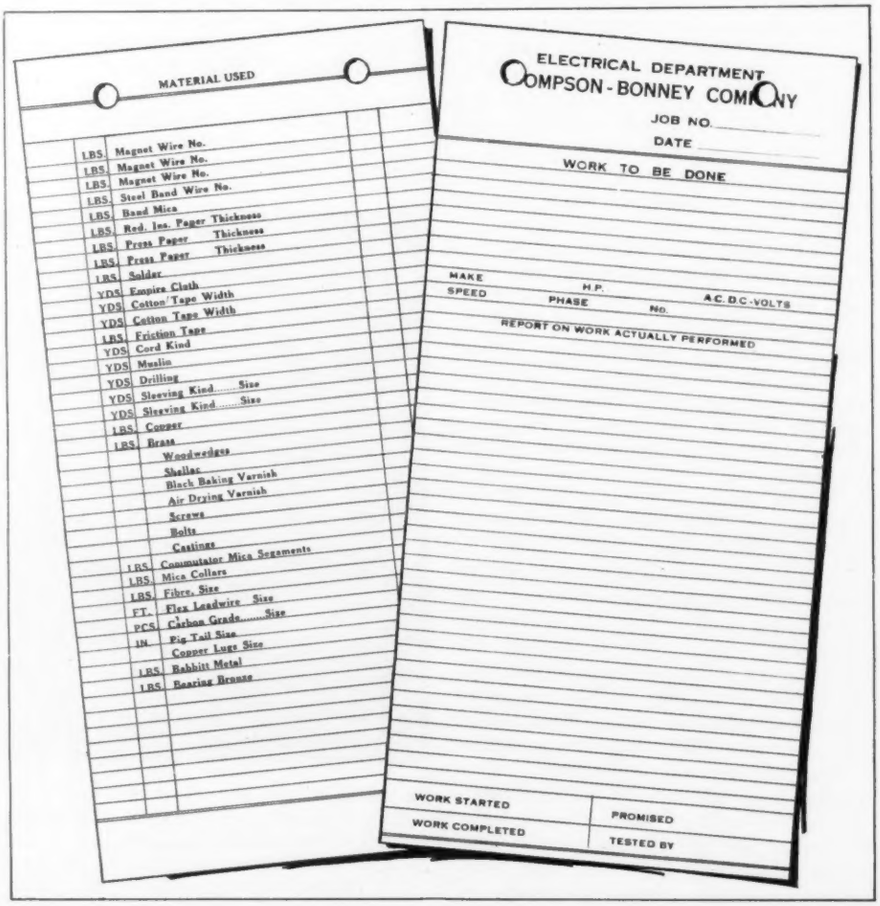
QUAN.	UNIT	DESCRIPTION OF MATERIAL	UNIT COST	UNIT PRICE

A reproduction of the Thompson-Bonney Company estimate sheet used as a record form on all work coming into the shop that is to be repaired on a fixed price or contract basis. The different headings on the form indicate the purpose of the form

Thompson-Bonney does neither. Certainly, it must sell its services to its customers, but to do this it relies solely upon the prestige established from years of satisfactory service in the territory it serves. Of course, business is solicited by members of the company, but the Thompson-Bonney Company employs no salesmen, nor does it advertise to any great extent, yet, as one of the members of the company said, "We get our share of the business."

When a job comes into the Thompson-Bonney shop, the first step in starting the work is to assign to it a job number, whether it be a motor, a generator, or any other device, and from that time until the work is finished it is referred to by the job number alone. This number is then immediately recorded on three different types of forms. One of these is the work slip or shop order, the other is a cost sheet for recording labor and materials, while the third is a data sheet, used principally for motors and generators, merely to record their characteristics for future reference.

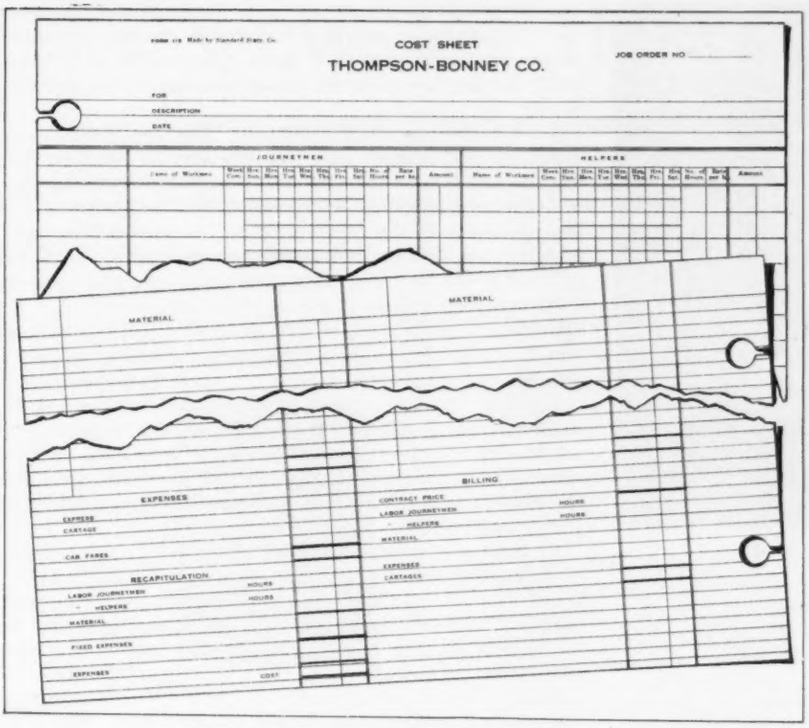
If the work is taken into the shop strictly as a repair job, with no estimated or contract price having been fixed, the job, say, for example, a motor, is carefully inspected for every possible defect. These are noted on the shop order form in a space provided for that purpose, as may be seen by reference to the accompanying illustration of the work slip. Incidentally, one of these forms is supplied to every man who does any work on the motor, for the reason that the Thompson-Bonney Company feels that it is necessary for it to know exactly what defects were found, what repairs were made, and by whom. In this manner they have an accurate record of each job, and as the work of repair progresses, each mechanic lists the repairs he has made, together with all new materials he has used, space being provided on the back of the form for listing materials only. When the job is completed, it is a comparatively easy matter to assemble all the work slips and from them compile accurate records of what was done and what materials were used. It should be noticed, too, that at the bottom of the face of the work slip spaces are provided for recording the time the work was started and finished, as well as the name of the workman who tested or inspected the work. This applies only to the operations of one workman, as each man enters his own time on this record. Then, to insure that there will be no mistake in recording the time, the Thompson-Bonney Company has provided cards and a time clock in the shop, to be used by the workmen to record the time they start or finish any one task. These cards are checked against the work slips, and in this manner provide an accurate disbursement of the workmen's time, which could not otherwise be obtained. This practice is very similar to that followed in mass production work in large industrial plants, where clerks record the start and finish of all work, to obtain an accurate record of the cost of each operation. This system also has the advantage that it supplies the Thompson-Bonney Company with invaluable records of the actual cost and the time required to perform any of the operations incident to


MATERIAL USED

LBS. Magnet Wire No.
LBS. Magnet Wire No.
LBS. Magnet Wire No.
LBS. Steel Band Wire No.
LBS. Band Mica
LBS. Red. Ins. Paper Thickness
LBS. Press Paper Thickness
LBS. Press Paper Thickness
LBS. Solder
YDS. Empire Cloth
YDS. Cotton Tape Width
YDS. Cotton Tape Width
LBS. Friction Tape
YDS. Cord Kind
YDS. Muslin
YDS. Drilling
YDS. Sleeving Kind ..... Size
YDS. Sleeving Kind ..... Size
LBS. Copper
LBS. Brass
Woodwedges
Shellac
Black Baking Varnish
Air Drying Varnish
Screws
Bolts
Castings
LBS. Commutator Mica Segements
LBS. Mica Collars
LBS. Fibre, Size
FT. Flex Leadwire Size
PCS. Carbon Grade ..... Size
IN. Pig Tail Size
Copper Lugs Size
LBS. Babbitt Metal
LBS. Bearing Bronze

ELECTRICAL DEPARTMENT
THOMPSON-BONNEY COMPANY
JOB NO.
DATE
WORK TO BE DONE
MAKE
SPEED H.P. A.C. D.C. VOLTS
PHASE NO.
REPORT ON WORK ACTUALLY PERFORMED
WORK STARTED PROMISED
WORK COMPLETED TESTED BY

At the right is a reproduction of the Thompson-Bonney Company work slip or shop order. One of these forms is used by each workman to record the amount of his time and the amounts of materials. It also shows just what work is to be performed, who did it, and who tested the work after completion. These forms are a valuable adjunct in figuring costs and determining factory charges or overhead


COST SHEET
THOMPSON-BONNEY CO.
JOB ORDER NO.
FOR
DESCRIPTION
DATE
JOURNEYMEN
HELPERS
MATERIAL
MATERIAL
EXPENSES
EXPRESS
CARTAGE
CAR FARES
RECAPITULATION
LABOR JOURNEYMEN HOURS
" HELPERS HOURS
MATERIAL
FIXED EXPENSES
EXPENSES COST
BILLING
CONTRACT PRICE
LABOR JOURNEYMEN HOURS
" HELPERS HOURS
MATERIAL
EXPENSES
CARTAGES

The Thompson-Bonney Company cost sheet is shown above. One of these is made up for each job, and after the work is completed the form furnishes a complete cost record of all labor and materials used on the job. In addition, provisions are made for a recapitulation of the cost of the job and the amount of the bill to the customer

reconditioning motors and generators of all sizes and makes. These are the records, also, that make it possible for Mr. Lauth to say that he knows the production cost of every job that passes through the shop.

In similar cases, but when a specific amount of work is to be done on a motor, for example, on a fixed contract or estimated contract price basis, another type of form is employed. This, too, is shown among the accompanying illustrations, and is designated as the estimate form. On it is a description of the equipment to be reconditioned, with a specific statement of the work to be performed, together with the contract or estimated price of the work. This slip also goes into the shop with the work, and on its back provisions are made for each workman to enter his time, together with the materials he uses. When the job is completed, these amounts for labor and materials can be totaled and compared with the estimated price of the work, thus serving as a check in assuring careful estimates on work of a similar nature.

The cost sheet is purely an office record. As can be seen from the illustration of it, the face of the form is employed for a description of the work, with spaces for recording the time, rate of pay and total amounts of labor for both mechanics and helpers. The double lines in this case are necessary, because the Thompson-Bonney Company makes a practice of differentiating between shop time and field time, the former being entered on the top line in black ink and the field time on the second line in red ink for each workman. As is the case with the two forms previously described, the cost sheet also has spaces for recording the amounts of materials used on the job. These are on the back of the form, together with columns for entering all other charges in connection with the work. At the right side of the form and near the bottom of the back of the sheet is another section to record the billing of the account to the customer. Once one of these sheets is completely filled in, it is filed for future reference, for, as is generally well known in electrical circles, motors and generators frequently are returned for repairs from time to time, and with the Thompson-Bonney Company it is but a simple matter to determine what was done to the motor when it was last in the shop, and just what the work cost at that time.

As a further check of this nature, the company keeps what it calls a data sheet of each motor. This is filled out by the shop foreman, and as may be seen from the illustration, it shows briefly every essential characteristic of a motor or generator. These are merely for reference purposes, which, augmented as they are by the cost sheet, furnish an invaluable record for reference.

In so far as the books previously mentioned are concerned, they consist of but a sales book, a merchandise book and a petty cash book. In the sales book the company enters all amounts received by the company, whether for materials, services, or labor. The merchandise book is used for entering all amounts paid out by the company for any purpose or thing, while the petty cash book, as the name would indicate, is employed solely for the purpose of recording the expenditures from the petty cash fund that is maintained in the office at all times. There is nothing unusual about the books nor the methods of making entries into them, or about the

The men at the right are winding, spreading and taping coils in the motor repair shop of the Thompson-Bonney Company in Brooklyn, N. Y. The machine at the extreme left of the illustration is a home-made coil winder that is described more in detail in the article, the others being of a standard make, as may be seen from the illustration

This is an illustration of a home-made coil winder as it is used in the motor repair shop of the Thompson-Bonney Company, of Brooklyn, N. Y. The machine was made from parts of a power saw and is very useful in winding coils, spooling wire, and many other similar winding operations

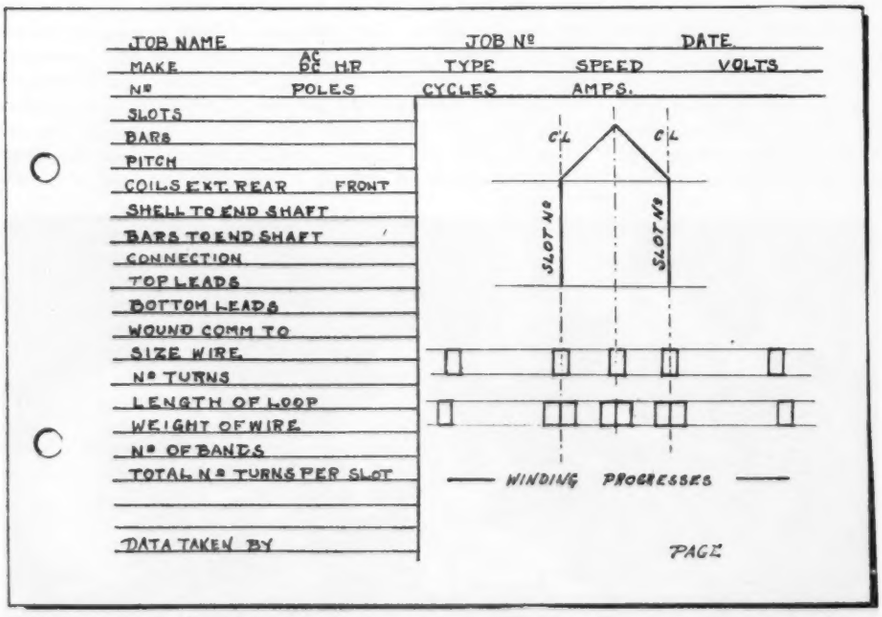
arrangements of the accounts. The principal thing is that they serve as a most valuable adjunct in determining the overhead and financial standing of the company.

To do this, the books are audited twice a month by certified accountants, and at the end of each month a balance sheet is made to show the exact financial condition of the business. It is true that most organizations balance their books at the end of each month, but the Thompson-Bonney Company does just a little more, merely for the sake of determining its overhead for the next month. This is based always on the business for the previous month. Then, in the event that the company has operated for a month at a loss, which many companies do at times, this is shown clearly in the financial statement, thereby enabling the planning of operations to offset the loss as quickly as possible. In this manner the company carries on its business from month to month, readjusting overhead charges as conditions warrant, rather than once each year, when it is too late to reduce or minimize any losses except in the business of the following year.

In the way of shop equipment, the Thompson-Bonney Company has an unusually large number of machine tools. On the first floor, where the heavy work is performed, there is a planer, a shaper, a drill press, a power saw and a milling machine. In the repair shop on the second floor of the building is a drill press, a band saw, three lathes, a gas and an electric baking oven, the testing equipment and the usual shop benches, together with a coil-winding machine, a coil spreader, a taping machine and equipment for slotting commutators. Serving all of the machines, the baking ovens, the benches and the dipping vats is an overhead monorail fitted with chain hoists. This is also so arranged that it serves the elevator as well, thus eliminating any heavy lifting. Both of the baking ovens are automatically controlled with respect to time and temperature, and the band saw, as well as a paper-trimming knife, are used for cutting insulation and for making forms.

Probably the most interesting machine in the shop is a home-made coil winder. It was constructed from parts of a power saw and is shown in one of the accompanying illustrations. Mandrels and adapters have been provided for the spindle, so that the machine may be used for winding coils, banding armatures, spooling wire, winding field coils and other similar operations. It is motor driven with a rheostat speed control, and can be run at 3600 r.p.m. The motor is reversible, and in addition to the rheostat, the machine is fitted with a portable treadle that can be placed conveniently near the operator's foot. It, too, is so constructed that the operator can start, stop or reverse the direction of the spindle by manipulating the two pedals of the treadle.

Practically all the machines are belt driven, and at convenient locations throughout the shop push buttons have been installed for starting and stopping the machines. This feature alone is worthy of consideration, in that with the push buttons handy the operators stop the different machines as soon as they have completed an operation, whereas, were they required to cross the shop to the switchboard to stop the machines, it would entail the loss of considerable time. Then, too, there is the safety feature, in that a machine can be stopped instantly in the event of an accident.



This is a reproduction of the data sheets used in the Thompson-Bonney Company motor repair shop in Brooklyn, N. Y., for the purpose of recording the characteristics of motors and generators brought in for repairs. This form is also filed for reference

Since the power supply to the shop is direct current, Thompson-Bonney has installed an alternating current generator for testing equipment of that type. This, with other equipment, makes it possible to obtain either direct or alternating current of almost any voltage and amperage. It should be understood in this respect that every repaired motor or generator is thoroughly tested before it leaves the shop, and, in addition, all devices are thoroughly cleaned and painted.

The Thompson-Bonney Company has about thirty employees, and one of the workmen has been with the company since it started in business thirty-three years ago, while William J. Lauth has been employed by the company for the past twenty-seven years.

News of the Month

A department containing news of electrical manufacturers and also other news of the industry that may be of importance to them

Dudley Honor Prize Awarded to Alfred de Forest

Alfred V. de Forest, research engineer for the American Chain Company, has been awarded the Dudley National Medal by the National Society for Testing Materials in recognition of his achievement in perfecting the non-destructive test for materials. Mr. de Forest invented the electric galvanometer capable of detecting a flaw, no larger than a pinhead, in the center of a large steel wheel without cutting or marring the surface of the metal.

Alfred V. de Forest

In operation, the galvanometer is comparable to the X-Ray, which penetrates the tissues of the human body without harming them. A plate or piece of steel five or six inches thick may be explored almost as though it were made of glass.

Mr. de Forest, a graduate of the Massachusetts Institute of Technology, was formerly instructor in civil engineering at Princeton. He later studied metallography at Columbia, then spent two years in the research department of the Remington Arms Union Metallic Cartridge Company. He has been chief research engineer for the American Chain Company since 1918.

Westinghouse War Memorial Scholarships Awarded

Winners in the 1928 competition for war memorial scholarships of the Westinghouse Electric & Mfg. Co. have been announced as follows: Paul S. Marthens, Turtle Creek, Pa.; Winton M. Dudley, Oakmont, Pa.; Marshall A. Wilson, Chicago, Ill., and D. Gordon Sharp, Bloomfield, N. J. The scholarships, awarded annually in memory of Westinghouse employees who served in the World War, provide annual payments of $500 each to be applied toward a four-year engineering education in any technical school or college selected by the winner.

RMA Convention and Trade Show in Spring 1929

Announcement that the fifth annual convention and third annual trade show of the Radio Manufacturers Association would be held in the late spring of 1929 has been made by Major Herbert H. Frost, president. Two other radio associations will hold meetings of their own concurrently with that of the R. M. A.—the Federated Radio Trade Association and the National Association of Broadcasters, which, with the Radio Manufacturers Association, form the radio triangle which does so much to promote the industry. The fourth annual meeting and trade show, held in Chicago last June, drew 24,657 radio dealers, jobbers, and manufacturers. It is not known where the 1929 convention will be held, invitations having been received from nearly 100 cities throughout the country.

Quebec Adopts Regulation on Electrical Materials

Electrical materials, accessories and apparatus, whether of domestic or foreign manufacture, which are sold in the province of Quebec must be approved by the Hydro-Electric Power Commission of Ontario's Laboratories, Toronto, or by the Underwriters' Laboratories, Chicago, according to Walter J. Donnelly, trade commissioner, Montreal. The sale of all other apparatus not approved by either laboratory has been forbidden since July 1. The new regulation is incorporated in "The Protection of the Public Against Fire" act, adopted by the Quebec legislature.

Reorganization of F. R. T. A. Introduces New Branches

With the recent reorganization of the Federated Radio Trade Association, individual branches for manufacturers' representatives, radio wholesalers, radio retailers, and local radio trade associations were formed. George Riebeth, of the French Battery Company, Minneapolis, heads the Manufacturers' Representatives Section.

George Riebeth

Each of the four groups elects six men to the board of directors of the Federated, which governs the activities of each. The groups, however, are managed by a president, officers, and committees of their own. Through their close relation to the major association the groups cooperate with one another and prevent many needless disputes.

The plan, developed through a special reorganization committee which investigated the needs of the various sections, was approved and adopted at the recent convention of the association in Chicago, at which time Harold J. Wrape, president of Benwood-Linze Company, St. Louis, was reelected president.

Goodwin Has Renewal Parts Post With Westinghouse

W. C. Goodwin has been appointed manager of the Renewal Parts Engineering Department of Westinghouse Electric & Manufacturing Company, having been section engineer of the Control Engineering Department since 1922.

W. C. Goodwin

Mr. Goodwin entered the graduate student's course of Westinghouse in 1915, following his graduation from Pennsylvania State College, and in 1917 was assigned to the Control Engineering Department on design work. While section engineer of this department he was sent to Europe for two years as Liaison Engineer with European companies having relations with Westinghouse, visiting England, France, Italy, Norway, Germany, and Czecho-Slovakia. He is a member of the American Institute of Electrical Engineers, having been secretary of the Pittsburgh section, and is affiliated with the Engineering Society of Western Pennsylvania.

First Steps Taken in Rural Electrification Project

Announcement has been made by the Committee on the Relation of Electricity to Agriculture that preliminary work on the National Rural Electric Project, to be located near Washington, D. C., has been started. As a preliminary step, a portion of the equipment for the Sandy Spring community, one of eight farms to be used in establishing the project, has been obtained.

The Sandy Spring community is to contain a typical rural fire department. George W. Kable, Oregon project director, has been placed in charge of this undertaking.

Midwest Power Conference Adopts New Policy

The policy committee of the Midwest Power Conference announces that the fourth meeting of the organization will be held in Chicago the week of Feb. 10, 1929, meetings to be held every two years thereafter. While the outline of the conference will be practically the same as last year, the program for 1929 will be of

technical nature, papers being submitted by recognized authorities, giving a productive appeal to the various advanced classes of power engineers.

Recommendations have been made that the fourth conference be made up of the power engineering interests of the following societies: American Institute of Electrical Engineers, American Institute of Mining Engineers, American Society of Mechanical Engineers, National Safety Council, Western Society of Engineers, American Society of Civil Engineers, American Society of Refrigerating Engineers, and American Society of Heating and Ventilating Engineers.

United Cabinet—H. T. Roberts Consolidation Announced

Radio Allied Manufacturers Corporation has been formed through the recent merger of H. T. Roberts Company and United Cabinet Manufacturers Corporation. Sales office and display rooms have been opened at 1340 South Michigan Avenue, Chicago, where the Roberts company has been located for several years. H. T. Roberts is president, M. M. Scribner vice-president, and T. J. Shiltz treasurer.

Nema Publishes New Handbook of Apparatus Standards

National Electrical Manufacturers Association has published the "NEMA Handbook of Apparatus Standards," formerly known as the "Electric Power Club Handbook of Apparatus Standards," embracing standards of electric power, control and measuring apparatus for the generation, distribution and utilization of electric energy.

The book contains test, performance, and manufacturing standards of electrical apparatus, and each section, covering such apparatus as motors and generators, industrial control, transformers, switchgear, measuring instruments, and electric welding, is complete in itself, all the rules relating to each product being grouped together. Standard definitions, abbreviations, and symbols are included for each class of apparatus.

B. P. George Elected President of Credit Association

Benjamin P. George of the Beardslee Chandelier Manufacturing Company, Chicago, was elected president of the National Electrical Credit Association at its recent convention in Boston. Joseph H. Lecour, Mitchell Rand Manufacturing Company, New York City, was chosen vice-president. Frederic P. Vose and Walter S. Vose were reelected secretary-treasurer and assistant secretary-treasurer, respectively.

Manufacturers Plan for Fifth Radio Industries Banquet

Manufacturers, associations, and broadcasting systems will unite for the fifth annual Radio Industries Banquet, to be held Sept. 18 at Hotel Astor, New York City, under the auspices of the National Association of Broadcasters, Radio Manufacturers Association, and Federated Radio Trade Association in conjunction with the annual Radio World's Fair at Madison Square Garden Sept. 17-22.

Plans for two hours of entertainment, introducing a number of national celebrities, are under way, the entire program to be broadcast over the systems of the National Broadcasting Company and the Columbia Broadcasting System, augmented by a large number of other stations, members of the National Association of Broadcasters.

World's Largest Globe

Westinghouse Electric & Manufacturing Company has produced what is believed to be the largest globe for street lighting purposes in the world. It will be installed in the downtown street lighting system of St. Louis. Miss Virginia Wood gives one an idea of the lamp's size

Slagle Buys Utensils Company Entering Appliance Field

Purchase of the Fort Wayne Utensils Company by Lavern S. Slagle, president of Slagle Radio Company, Fort Wayne, Ind., and head of the Central Electric Company, chain of retail stores, has been announced. The companies will be consolidated, manufacture of the products of both industries to be continued.

Mr. Slagle plans to move the main offices of the radio company to the location of the Utensils company, East Pontiac St., where the major portion of manufacturing will be carried on, because of improved factory conditions. Further development of electrical appliances, now being marketed by Utensils, will be undertaken.

Newcombe-Hawley Joins United Radio Corporation

Merger of Newcombe-Hawley, Inc., St. Charles, Ill., with United Radio Corporation, Rochester, N. Y., has been effected, the new company to be called United Radio Reproducers, Inc. The combine will give each company stronger patent, engineering and financial positions, individual identities being retained. With United Radio licensed under Lektophone cone speaker patents, and Newcombe-Hawley licensed under Jensen electrodynamic patents, it is now possible for each company to manufacture a complete line of speakers.

Dellinger Appointed Chief Engineer of Radio Board

Dr. J. H. Dellinger was appointed chief engineer of the Federal Radio Commission July 30, subject to the approval of the Secretary of Commerce. He is chief of the radio laboratory of the Bureau of Standards and will assist the commission in drafting its plan for the reallocation of broadcasting stations. The appointment is for three months.

First National Electrical Exposition in New York

The first nationwide electrical trade show ever to be held will open Oct. 17 in Grand Central Palace, New York City, offering electrical contractors, wholesalers, retailers, and buyers of electrical goods an opportunity to see thousands of approved electrical devices exhibited and demonstrated in one assembly.

The show is an expansion on a national basis of the annual electrical show. The first three days will be reserved exclusively for the trade, the remaining seven being open to consumers and the general public.

Government Plans to Determine Amount of Obsolete Goods

The domestic commerce division of the Department of Commerce is to undertake a survey of industrial equipment to determine the amount of obsolete equipment and its importance as a factor in the inability of firms manufacturing similar products to compete on an equally profitable basis. Information will be sought which will indicate the advisability or inadvisability of replacing machinery which may have many years of usefulness, but which has not kept pace with style changes or inventive genius.

Radio Fair at Madison Square Garden in September

The fifth annual Radio World's Fair will be held in Madison Square Garden, New York City, Sept. 17-22, sponsored by the Radio Manufacturers Association.

New models, not ready for display at the Chicago show in June, will be exhibited for the first time. From Oct. 8 to 14, however, they will be shown in Chicago, when the Seventh Annual Chicago Radio Show will be held at the Coliseum for the convenience of western manufacturers.

New England Coast Selected for Beacon Fog Tests

The Bureau of Standards has completed a survey of selected sections of the New England coast to locate a suitable stretch of coast for tests on the fog-penetrating qualities of different types of lights, according to report of the Aeronautics Division, Department of Commerce. The report stated that "this coast is believed to be well suited to such work on account of the frequent occurrence of fogs along it. The location selected will give a visibility range of approximately four miles in length. An experimental flashing beacon equipped with neon and incandescent lamps will be erected, and observations made on the beacon over an extended period to determine relative visibility of the light sources under different weather conditions."

Edison Switchgear Committee Tours Westinghouse Plant

Members of the switchgear sub-committee of the committee on electric switching and switchgear of the Association of Edison Illuminating Companies recently were guests of Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa. The Westinghouse works were visited for the purpose of observing recent progress in switchgear and switching equipment.

Much Profit in Electricity on Farm, Says Bucknam

Electricity on the farm pays for itself twice over, according to R. F. Bucknam, New York State College of Agriculture. In reply to a questionnaire, it was learned that of 215 farms using central station service in 1927, a total saving of 8608 days of labor were achieved, or an average of 40 days a farm. The average of 40 days of labor at nearly $3 a day would pay the electric bill for nearly two years, according to Mr. Bucknam. The investigation disclosed the fact that the electric iron was the most popular labor saving appliance in use in the home, with vacuum cleaners, washing machines, and toasters following in order. For farm work the most widely used electric appliance was the milking machine, followed by the shop motor.

Giant Loud Speaker Obtained for Pacific Radio Show

Through the medium of a giant loud speaker, to be installed by the Radio Corporation of America, crowds attending the Pacific Radio Show in San Francisco, Aug. 18-25, will hear the entire program with little difficulty. The model to be used was recently tested at Schenectady, N. Y., where a broadcast was heard at a distance of three and a half miles. The device can be modulated to any desired volume for use at small gatherings.

First Officially Recognized Aerial Beacon in Chicago

Chicago's first recognized air beacon was turned on July 15, located on Roanoke Tower, 125 West Madison Street, 520 feet above the heart of the loop. The light, which is visible for 100 miles on clear nights, is the first in the country to be officially recognized by the Department of Commerce and the United States Bureau of Lighthouses. It flashes "Chicago" in international code and has been equipped with auxiliary lamps to insure continuous operation.

Johan M. Andersen, Boston Manufacturer, Dies

Johan M. Andersen, president of the Albert & J. M. Anderson Manufacturing Company, Boston, Mass., died at his home in Brookline, July 25. He was in his seventy-third year.

Mr. Andersen was born in Norway and came to this country 48 years ago, joining his brother Albert in business.

Johan M. Andersen

He was a pioneer in the manufacture of overhead line material and moulded insulation, designing many of the present day standards.

Many notable achievements in the design and construction of switches and circuit breakers are attributed to Mr. Andersen. He was well known among power plant engineers and was a member of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, and the New York Electrical Society.

Obituaries

Thomas F. Logan, 42, president of Lord, Thomas & Logan, advertising agency of New York, Chicago, and London, died August 9 at his home, Ardsley-on-the-Hudson, after a brief illness. Mr. Logan organized the agency of Thomas F. Logan, Inc., in 1919, and effected a merger of his company with Lord & Thomas in 1926.

Edwin Britton Katte, 58, prominently identified with the development of electric transportation in this country and at the time of his death chief engineer of electric traction for the New York Central Railroad, died July 19 at his home, Land's End, Irvington-on-Hudson.

Herbert Lloyd, president of the Electric Storage Battery Company, Philadelphia, died July 3. He joined the Philadelphia company in 1888 as superintendent and manager, succeeding W. W. Gibbs, president, 22 years ago.

Adam H. Zies of the Galvin Electric Manufacturing Company, St. Louis, died recently at his home in St. Louis.

Walter F. Field, president of Safety Cable Company, division of General Cable Corporation, died July 6.

Brevities

Westinghouse Air Brake Company announces that Westinghouse Union Battery Company, Swissvale, Pa., has become the Wubco Battery Corporation. Complete equipment of the former has been retained. J. L. Rupp is president of Wubco.

Dubilier Condenser Corporation has opened offices at 330 S. Wells St., Chicago, and 1524 Chestnut St., Philadelphia. Fred Damarin and Joseph H. Myers are in charge, respectively.

Auto-Diesel Piston Ring Company, Cleveland, announces the addition of a spring and wire forming department through the purchase of Austin & Smith Company, of that city.

Grigsby-Grunow announces that Irving Sarnoff has organized the Sterling Radio & Electric Company to distribute their products in New York City.

Reynolds Electric Company, Chicago, has taken over the Korrectolite Company, Eben F. Oliver, general manager, becoming a part of the Reynolds personnel.

C. E. Manufacturing Company, Providence, R. I., has taken the name CeCo Manufacturing Company, the name being derived from the leading product of the company.

Kodel Radio Corporation, Cincinnati, has changed its name to Kodel Electric & Manufacturing Company and has increased its common A stock from 55,000 to 100,000 shares.

De Forest Radio Company is now controlled by W. R. Reynolds and associates, following complete reorganization. The company is equipping its factories at Jersey City for the introduction of a new radio tube.

Schwarze Electric Company, Adrian, Mich., manufacturer of electrical signalling devices, has changed ownership, being now controlled by P. C. Reck, president, and Fred Tag, secretary-treasurer. J. B. Higgins remains as director of sales with Edward Holtz as assistant.

A. H. Grebe & Company, Inc., has leased space totalling 13000 sq. ft. in the Ford Building, Northern Boulevard, Long Island City, New York. Present shipping and storing facilities of the

Grebe plant at Richmond Hill will be consolidated in the new quarters.

Moloney Electric Company, St. Louis, manufacturer of transformers, has been purchased from the American Brown Boveri Electric Corporation and will be operated under the ownership and management of T. O. Moloney and James J. Mullen.

Charles Freshman Company, Inc., New York City, announces that Warren J. Keyes, recently treasurer of Sonora Phonograph Company, has been elected a director, vice-president, and treasurer of the company. Henry A. Beach and George J. Eltz have been elected vice-presidents.

Rainbow Light, Inc., operating subsidiary of Rainbow Luminous Products, Inc., will increase the capacity of its Detroit plant to meet the growing demand in midwestern states for tube-lighting equipment, according to E. C. Bull, president.

Shull Sales Corporation has been formed by Frank Shull, manufacturer of electrical switchboard equipment in Washington for the last 20 years. The company will produce oil burners.

Thermodine Manufacturing Company, 1705 Racine Street, Racine, Wis., has changed its name to Modine Manufacturing Company.

Schneider Brothers, Inc., is the new name of Schneider Electric & Manufacturing Company, 312 N. Sheldon St., Chicago, manufacturers of molded insulation. Factory and production facilities have been enlarged.

General Electric Company recently paid $1,600,905 in supplementary compensation to employees in its various plants and offices who have been in its employ for five years or more.

The Eighth International Hoover Convention, held July 10-21 at Hoover Camp, North Canton, Ohio, was conducted in two sections, the first week for salesmen, with an approximate attendance of 340, and the second week for managers and supervisors, with 450 delegates. The Field Service Department, 40 attending, was in session at the same time. Business sessions were held three times daily on sales, advertising, and engineering subjects.

Personals

R. F. Schuchardt, electrical engineer with Commonwealth Edison Company, Chicago, has been elected president of the American Institute of Electrical Engineers.

J. R. Lovejoy, George F. Morrison and B. G. Tremaine, veteran officials of General Electric Company, were recently named honorary vice-presidents, the office being created on their retirement. W. R. Whitney and T. W. French are now vice-presidents of the company.

M. W. McArdle has been elected president of the Chicago Flexible Shaft Company, 5600 W. Roosevelt Road, Chicago. He was formerly first vice-president and general manager and has been identified with the company for more than twenty years. The company manufactures electrical appliances.

Charles J. Hopkins, manager of the foreign department of Crosley Radio Corporation, sailed from New York July 28 for an extended business tour of Mediterranean countries. He plans to visit the leading trade centers in Italy, Spain, and Portugal.

J. C. Stanley has returned to the sales staff of Federal Radio Corporation following an absence of two and a half years. He will cover territory including the states of Wisconsin, Minnesota, North and South Dakota, Iowa, Nebraska, and Colorado.

Fred Johnson, manager of the St. Louis sales office of Wagner Electric Company, has been appointed to take charge of the Los Angeles branch office, following 21 years service in St. Louis territory. He will be succeeded in St. Louis by Alex L. Miltenberger, formerly manager of the San Francisco office.

Glenn A. Wilson, for the last three years sales manager of the Barnett Foundry and Machine Company, has resigned to become vice-president and general manager of Strongson Products, Inc.

Frank W. Sickles has purchased the holdings of H. C. Hyde, G. E. Boynton, and A. L. Bausman in the F. W. Sickles Company, Springfield, Mass.

G. H. Wygant has been appointed sales manager of the Electrical Supply Company, New Orleans. He was formerly manager of the wholesale electrical firm of Knight & Wall, Tampa, Fla.

George O. Muhlfeld, vice-president of Stone & Webster, Inc., has been elected president of the new Stone & Webster Engineering Corporation. This corporation has taken over all construction and engineering business of Stone & Webster, Inc.

N. H. Boynton, National Lamp Works, General Electric Company, has been elected chairman of the Greater Market Development Committee of the Automotive Equipment Association.

H. C. Holmes has been appointed general sales manager of the DeForest Radio Company. He was formerly vice-president of Henry L. Crowley & Company, manufacturers of synthetic ceramic products.

W. H. Bishop has been appointed special sales representative of Grigsby-Grunow Company in the New York metropolitan district.

James A. Ramsey has been appointed district sales manager of Kolster Radio for the Pacific Coast.

H. D'Almaine has been appointed assistant sales manager of the Bodine Electric Company, Chicago.

Coming Conventions

American Institute of Electrical Engineers
Regional meet at Atlanta, Oct. 29-31.
Pacific Coast convention at Spokane, Aug. 28-31.

American Welding Society Fall meeting in Philadelphia, Oct. 8-13.

Illuminating Engineering Society
Meeting at King Edward Hotel, Toronto, Sept. 17-20.

National Association of Practical Refrigerating Engineers
Meeting at Louisville, Ky., Nov. 20-23.

National Electrical Credit Association
Annual meeting of Central Division at Chicago, Nov. 15-16.

National Electrical Manufacturers Association
Apparatus Division at Briarcliffe, N. Y., Oct. 29—Nov. 1.

National Safety Council
Meeting in New York City, Oct. 1-5.

Removals

Mitchell Vance Company, located on West 24th St., New York City, for 71 years and first in the country to place electrical fixtures on the market, has moved to the Robert Gair Building, 70 Washington St., Brooklyn.

Mogadore Insulator Company, Mogadore, Ohio, announces removal to a new factory at Akron and a change in name to Akron Porcelain Company. There will be no change in the personnel or status of the company.

Acme Lighting Fixture Company, formerly located at 107 W. 13th St., New York, has taken over larger quarters at 49 W. 24th St.

Britesun, Inc., has purchased a building at 3735-39 Belmont Avenue, Chicago, where there are increased facilities for manufacturing.

Acme Electric & Manufacturing Company, Cleveland, has moved its general offices and factory from 1653 Rockwell Avenue to 1439 Hamilton Avenue.

National Association of Manufacturers has moved from 50 Church St. to 11 W. 42nd St., New York City.

Sterling Manufacturing Company has moved from 1014 Chestnut St. to 2630 Cherry St., Erie, Pa.

Gotham Telephone & Signal Company announces removal from 105 Hudson St. to 110 4th Ave., New York City.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Ave., New York City:

"Patrician" Line of Lighting Fixtures.
"Splendida" Electric Iron.
"Sal. Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Wharton" Battery Charger.
"Flint" Waffle Iron.
"Packard" Vacuum Cleaner.
"Blaisdell" Automatic Electric Cigar Lighter.

"Hollingsworth" Emergency Lighting System, asked for in our July issue, is manufactured by Hollingsworth Co., 1725 Sansom St., Philadelphia, Pa.

Applying Insulating Materials to Coils and Windings

No. 4 of a Series on Insulating Varnishes and Impregnating Compounds

In the dipping and baking of railway, mining and crane type motor armatures, it is important that the ventilating ducts be kept clear of varnish

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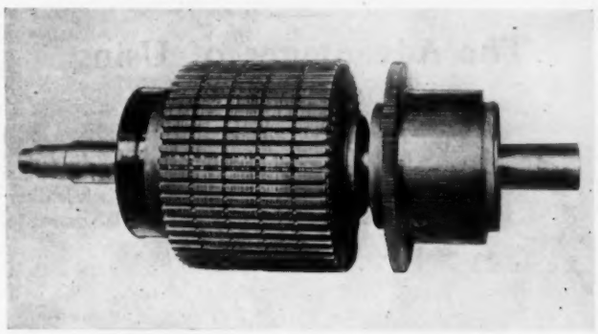
THE following article is a continuation of the third section of this series and completes the discussion of the insulation of completely wound apparatus. In the preceding article, completely wound apparatus was divided into two types: A—A.C. stators or stationary types of windings; B—A.C. and D.C. rotors. This means of classification simplifies the problem of discussing the proper methods of applying insulating materials.

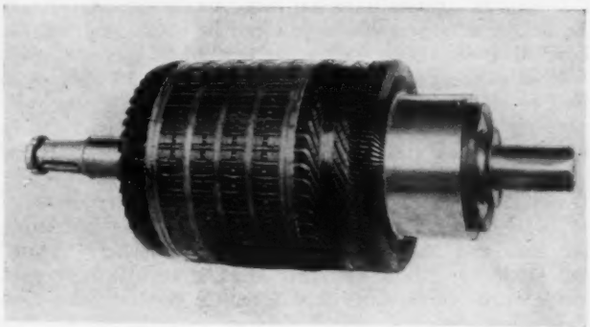
Strap or bar wound rotors include the one coil per cell, half coil shove-through type, and the partly closed slot over-hanging tooth strap coil. These are usually wave-wound, and in either case a tight fit in the slot sections cannot always be maintained, owing to winding conditions. Also, with the half coils we have connecting clips at each end of the rotor, and with one end closed as with the one turn coils, we still have clips at the slip ring end. If the space between clips is one-eighth inch or more, these clips need not be taped for voltages up to 550. If the rotor is dipped



This direct current armature is completely assembled and the slots are cleaned ready to receive the coil winding in the open slots before the application of the insulating compounds

and baked, the slot sections are sealed, making a tight job, and also adding an insulating coat on the clips which can be further improved by spraying all the clips with a glossy black air drying varnish. If the bars or coils of this type of winding have been dipped before the winding operation, then the complete rotor can be sprayed with air drying varnish on emergency jobs.

Wound rotors with partly closed slots or over-hung teeth are built up to and above 1500 hp. The coils are formed from strap copper, and each individual strap is insulated as a complete coil. The straps are threaded-in one at a time. On some of these rotors the maximum voltage-per-phase runs up as high as 2000 to 3000 volts, particularly on reversing motors at the time of reversal, and this type of apparatus requires the treatment and care that high voltage equipment demands. Such coils, in some cases, require



The completed direct current armature shown in the preceding illustration is shown here after being wound, banded, dipped in insulating varnish and baked ready for service

five dips, and the complete rotor three to five dips to give a hard glossy finish.

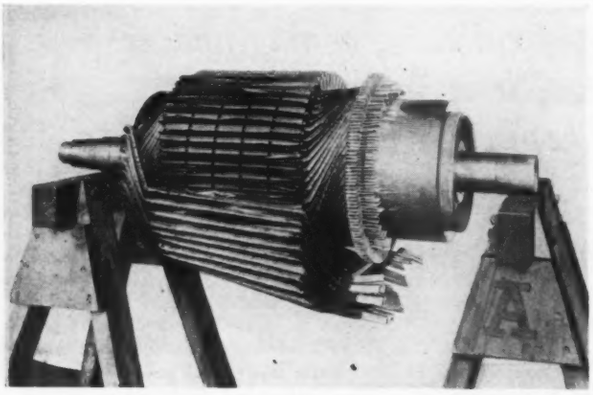
The next type of rotor is the D. C. armature. This includes the small hand or machine wound fan motor armatures up to the large rotary converter armatures. In the smaller sizes the coils are usually wound into the slots direct from reels of wire, or mush coils are used and threaded into the slots. Such armatures require at least one dip and bake, and more if exposed to steam, excessive moisture, oil, etc.

Another type of rotor is the medium size D. C. armature with open slots and insulted coils. For ordinary industrial use, a spray coat of air drying varnish is satisfactory, but one dip and bake is better if the additional cost and time required is not a deciding factor. When the armature diameter is too large to permit dipping and baking with the equipment on hand, one or more coats of well applied black air drying varnish can be given the finished winding.

All railway and mining motor armatures, also crane type

motor armatures using wire wound coils, should be given one dip and bake after winding. With this type of armature, care should be taken not to clog up the ventilating ducts with the varnish. In case the varnish can get into these ducts from the inside of the armature, do not plug up any outside openings, since this would trap the varnish and prevent it from draining out. It is important, therefore, to examine the rotor construction carefully before ventilating ducts are plugged to keep varnish out.

These armatures should be dipped vertically, with the commutator end up and drained in the same position, unless the construction of the core and spider is such as to allow



This type of direct current armature with the open slots and completely insulated coils should receive at least one dip in insulating varnish and should then be baked for best results

the varnish to drain out better if the armature is swung to a horizontal position and slowly rotated.

When an armature is too large to be dipped, but can be baked, a large shallow pan can be made, and the pan blocked under the armature, so that when it is rotated it will be submerged in the varnish to a depth of about one-half to one inch below the bottom of the slot section. By rotating the armature a little at a time, each part can be allowed to soak and drain.

All commutators should be kept out of varnish. The reason is that in any type of commutator there are a number of open spaces, as at the bottom, between the bottom of the bars and bushings, and other places where varnish can get in but cannot get out. Thus, if varnish is trapped inside of the commutator it will remain wet for some time and cause trouble.

Reference has been made to more than one dipping for a good insulating job where protection against, moisture, oil, etc., is required. The object of applying more than one coat of varnish to a coil or a completed winding is, first, to fill all of the pores of the untreated materials; second, to fill any small spaces, seal joints, provide a hard glossy surface that will not collect dust and can be easily cleaned, and one that will not carry or sustain an arc. The more coats of varnish, the thicker and glossier the film. When exposed to dust that is abrasive, or steam, water, acid fumes, etc., the extra dips provide a film that will not easily be affected, and therefore the life of the winding will be longer.

Best results from one or more dips of varnish depend upon the type of varnish used, its consistency and time allowed to soak; but, most important, the time taken to dry each coat before applying another. Before repairing any type of armature, the things to study before even starting the coil work is the application. If the old winding itself does not show the reason for the failure, this information should be obtained by finding out just what the motor is used for, what the location is, and whether acid fumes, steam, or other moisture is present. Then note the voltage and the type of motor. Decide on the final treatment from this information, and then work back to the first stages of the coil construction, and draw up a specification for the treatment of the coil and for the completed winding. This will insure a well balanced coil that will give long life.

As to pasted end windings, in some cases it may be necessary to cover the complete end windings of stators with a compound, either by dipping in a heavy compound or applying it like a paste. This method plasters the space between coils and core where the coil ends project beyond the iron, and also between loops on the end, so as to cover the whole end winding. This coating can be given a number of applications of an air drying or baking varnish, depending on the type of finish required. A winding plastered or packed with a suitable compound will be absolutely water tight.

If the iron core has been filled by giving the armature a few dips and bakes, the winding will also be better protected from oil, acid, alkali and metallic and abrasive dusts. The more compact the winding is made, and with the insulating materials protected from deteriorating agents, the longer will the life of the apparatus be prolonged.

The one thing to watch in the use of the pasted or packed end winding is thermal conductivity. This allows no ventilation of the end windings from windage resulting from the rotation of the armature, so that there must be good ventilation through the core when this type of end winding insulation is used.

The procedure which has been outlined applies to special jobs where the insulation must be used to correct troubles in operation, such as the probability of the motor getting oil soaked, full of dust, exposed to corrosive acids, hot or cold water, steam, etc. When rewinding such a motor, the start in the process, to insure good insulation, is to clean and dry the iron core thoroughly. All oil, and dirt that has baked on, must be removed. Then proceed with the insulation of the coils for maximum service protection, dip and bake several times; then apply the coils to the core and dip and bake the completed winding several times, or until a glossy surface is provided that is hard and uniform. Such a winding will give long and satisfactory service.

The next section of this article will take up preparation of materials for varnish treatment and also give procedure for impregnation of windings by the vacuum process.

The Advantages of Using Stock Belting

By W. F. Schaphorst

A PROMINENT manufacturer of leather belts points out reasons why it is a good rule to buy stock leather belts in preference to leather belts that are special or made to order.

He states that it is always well to allow leather to season before making it into stock so that the moisture content will be just right and so that the leather will have an opportunity to "set." In the stretching process the leather fibers are more or less distorted and they naturally must adjust themselves during the seasoning period. Seasoning requires time.

It is obvious, therefore, that if new hides are purchased for the making of a special belt, quickly tanned, quickly stretched, and then made into belting, all within a short period of time, the belt may not be properly seasoned and the chances are that it will not give as good results as would a "stock" belt.

It is also pointed out that when an order is received for a belt to be specially made, the manufacturer is "certain" that he has made the sale, which may lead to a bit of carelessness in mixing seasoned hides with hides that are not seasoned.

The CONSUMER Makes *the* Decision

A discussion of the proposals of the electrical industry relative to arousing the interest of the public in greater home consumption of electricity

BY DR. PAUL T. CHERINGTON*
Director of Research,
J. Walter Thompson Company

WE still think of consumers in the terms in which they were described by the early economists; timid souls on the verge of starvation and open to all sorts of harmful suggestions. In many ways they have changed, and especially is this true in the United States. Average income, wages, savings, insurance, automobile ownership and operation, a ten-fold increase in the cosmetic bill—all these and many other evidences of prosperity are familiar, and it should be remembered that this means not only that these millions of consumers have surplus funds above what they require for necessities; it means also that with this surplus the consumer has acquired freedom of choice as to its expenditure. The man whose entire earnings are absorbed in providing a bare living has little choice as to how his money will be spent; but when he has a cash surplus he can choose when, where, and for what he will spend it.

Dr. Paul T. Cherington

One thing more ought to be recalled in this connection. The consumer uniformly will make these decisions in his own interest. This surplus is the consumer's return for his expended life; and when he starts out to spend it he insists on having in return for it a full money's worth. No matter how open handed and generous he may be in his charities, when he buys consumer goods the consumer is supremely and inalterably selfish, or he is a half-wit. Anybody approaching the American market with anything to sell, out of which he hopes to make a profit, will do well to follow Ford's example and remember that the big prizes go to the man who multiplies a serviceable idea—because in this market more than any other people have money to spend, and can be counted on to spend it in their own interest.

Ford's philosophy could be illustrated by scores of cases of other successful producers, showing that it is not high pressure selling, nor yet the persuasive power of advertising operating alone to which have gone the big prizes in modern trade. High pressure selling is not a power, it is a device; advertising is enormously useful and effective in arousing or directing public interest, but it also is a device and not a power. The power, the energy, the force which moves goods from producer to consumer is the combined will-to-buy of masses of consumers. The devices for stirring up the power or for directing it, once stirred, should not be confused with the power itself. All commerce ends in an individual consumer's decision to buy or not buy. That decision alone takes goods out of commerce and puts them into use, and takes money out of safe-keeping and starts it flowing toward producers. High pressure selling and advertising have not had their perfect work till consumers become disposed to buy; and when consumers move in large numbers toward a product the matter of profits is relatively simple.

The electrical industry proposes to go to the public and arouse a new interest in the greater use of electricity in the homes of the United States. This is a sound idea and one that if rightly developed has in it the element of service that has been the foundation for every great advertising success. But there are three things about the project that must be made absolutely and completely right before the costly appeal to the public is undertaken:

The first is that whatever idea is carried to the public to arouse greater interest in electrical matters, must be an idea originated and framed in the consumer's interest. No campaign based on the idea of bringing about a short-lived boom in the wiring business will get far, nor will one aiming to give a little boost to the size of the monthly household current bill. The manufacturers, the contractors, dealers, wholesalers, central stations, leagues, and all others who are concerned in this project should realize the necessity for settling this whole business on the basis of what Ford calls a "useful idea." In that way alone will the stirring of public interest yield satisfactory returns to anybody. If the selection of a central idea is based on the consumer's interest, it may be that the choice may turn out like Solomon's choice of wisdom—and that glory and riches and honor and other trifles may be added. But, in any case, this is the only basis on which the undertaking can possibly be worth while.

In the second place, the idea to be carried to the public must be a worthy one. No large body of consumers is going to be greatly excited over the idea of a couple of new base-plugs in the house, nor will they urge every friendly visitor to come down the cellar and look at the nifty new wires, nor to the laundry to inspect the iron. Whatever is worked out will need definite dramatic appeal; it must not only be in the consumer's interest, but it must stir his pride, or lay hold of some other basic moving impulse in a compelling manner. It must compete for the consumer's spendable surplus with many other "useful ideas" which

(*Continued on page* 100)

* *Abstracted from an address, "The Consumer Decides," delivered by Dr. Cherington at the electrical league conference, Camp Cooperation VIII, at Association Island, Henderson Harbor, N. Y., August 2 to 7 inclusive.*

Platinum—Its Uses in the Electrical Industry

No. 5 of a Series of Articles on Common Materials

The electrical industry is credited with a consumption of approximately 13 per cent of all the platinum metals used in the United States

By William Crawford Hirsch

ASIDE from radium at $70,000 a gram, which is employed rather than consumed in making luminous material for instrument dials and switchplates, platinum and its allied metals are the most costly materials used by the electrical industry. Visualize platinum at $75 to $80 a troy ounce being drawn through a diamond die, the black stone in which may cost more a carat than a pure white gem stone, and you can not help being impressed by the fact that the electrical industry, in addition to utilizing the lowliest of raw materials, such as clay and sand in electrical porcelain and glassware, goes in also for the most costly. It will be well to remember, however, that platinum is so ductile that out of a single troy ounce of the metal it would be possible to draw an almost invisible wire that would reach from the source of the Mississippi in Minnesota to its mouth at the Gulf of Mexico; a distance of more than 2000 miles.

Platinum, a white metal which resembles silver in appearance, was first found in commercial quantities in Colombia, South America, about 200 years ago, and called *platina* in Spanish, *plata* being the Spanish name for silver. Platinum occurs as native metal, in placers; as an alloy with palladium, rhodium, iridium and osmium, which are generally referred to as platinum metals; in the black sands of alluvial deposits and in some gold ores in Nevada and Wyoming; and in a mineral known as sperrylite, found in Sudbury, Canada, and in British Columbia. The principal commercial sources of primary supply are Russia and Colombia. Production of crude platinum in the United States is very slight, having totaled only 251 ounces in 1927; 160 ounces coming from California, 60 ounces from Oregon and 24 ounces from Alaska. American platinum refiners, however, treat a considerable quantity of foreign crude metal; their purchases of foreign crude platinum in 1927 having aggregated 47,297 ounces, of which 37,962 ounces came from Colombia and 4,473 ounces from Russia, with the remainder having its origin in Australia, Canada and other localities. Promising finds of platinum have recently been reported from Transvaal and Rhodesia in South Africa. Two years ago a platinum "strike" in the vicinity of Caribou Island caused many hardy prospectors to trek over trackless snow wastes into Northern Alberta, Canada, but in the absence of any marked growth in Canadian output, the "strike" must be put down as not having panned out.

Known Reserves Are Large

RUSSIA'S pre-war production of 200,000 ounces a year constituted four-fifths of the world output. During the first Soviet upheaval it fell to 11,000 ounces. Colombia, which up to the outbreak of the war, produced platinum at the rate of about 10,000 ounces per year, jumped into the breach and last year it marketed more than 55,000 ounces.

This dredge is all set up and ready to start work on a placer mining job for the American Platinum & Gold Dredging Company in the San Juan River Valley in the Choco Pacifico district, Colombia, South America. The purchases of foreign crude platinum in the United States for 1927 aggregated 47,297 ounces, of which 37,962 ounces came from Colombia and 4473 ounces from Russia, with the remainder having its origin in Australia, Canada and other localities

Meanwhile, the Soviet has in part rehabilitated its platinum industry, production in 1927 probably being approximately 100,000 oz. and the present rate of output about half what it was in the days of the Czar. The known reserves of alluvial ground with platinum content are large and completely under Soviet Government control. They contain approximately 7,000,000 ounces of platinum. The Soviet mining department also leases ground to Russian peasants and the lease is based on the miners returning a certain minimum amount of platinum, for which they are allowed so much per ounce, about 40 to 45 per cent of the world market price. As the Soviet reconstructed their platinum industry, they sought to devise ways and means for controlling the metal's price in the world's markets, creating an agency for the purpose of allotting certain quotas to different countries, following the lines of an international agreement to which Russia had, until then, adhered and which gave to each producing country a certain share in the world's consumption. With their platinum output on the rise, the Soviet did not consider their share large enough, and, therefore, withdrew from the international agreement. They threw so much platinum on the market that values declined 40 per cent. Because of the non-recognition of their government by the United States, the Soviet transact their platinum business from Berlin, the New York trading company, which represents the Soviet in commercial affairs, also being the sales agency for the Soviet's Berlin platinum subsidiary. In the last few years the Soviet have used a considerable part of the credit, which they were able to build up in the United States as the result of platinum importations, to buy large electric dredges, replacing small obsolete steam dredging machines with powerful electric units of 11½ to 13½ cu. ft. capacity. These American electric dredges bring forth 35,000,000 to 40,000,000 cu. ft. of dirt, and if a ton of it contains only a thousandth of an ounce of platinum, the operation is profitable.

Classes of Platinum Metals

NORMAL consumption of platinum and its allied metals in the United States is 175,000 ounces a year. Between 50,000 and 60,000 ounces are supplied by the recovery and refining of scrap. The remainder must be supplied by importations of either crude or refined metal.

The metals that are usually classed as belonging to the platinum group are palladium, iridium, osmium, ruthenium and rhodium. Iridium and osmium are used chiefly in the form of alloys to impart hardness to platinum for certain purposes. Market prices for these allied platinum metals are, however, independent of those for platinum, although the price of platinum has a great influence on the others. Iridium sells for approximately four times the price of platinum, while osmium, ruthenium and rhodium as well as palladium are approximately one-third lower in price than platinum.

The electrical industry is credited with consumption of about 13 per cent of all the platinum metals used in the United States. In round figures the annual purchase of platinum metals by electrical consumers is estimated between 22,000 and 23,000 ounces, three-quarters of which are made up by platinum and about one-sixth by palladium, the remainder being iridium and the other minor species.

Electrical Uses of Platinum

FROM an electrical point of view, the outstanding properties of platinum are its high resistance, approximately ten times that of copper, and its low coefficient of linear expansion. The melting points of the platinum metals are the highest obtainable in the metal group, ranging from 3191 deg. Fahr. for platinum to 4307 deg. Fahr. for iridium. The platinum metals are heavier than gold, the specific gravity of platinum being 21.53 and of iridium 22.40. Physically, platinum is the most ductile of all metals.

The major use of platinum in the electrical is in the form of contact points. While tungsten has displaced the precious metal in many uses, where contact points are called upon to withstand high temperatures and other severe conditions, as in certain kinds of induction coils and ignition devices of high amperage, platinum and platinum-iridium still find wide use in contact points. The explanation for the continued heavy use of platinum in many uses, as for instance, in telephone contacts and signal lamp lead-in wires, is that for these purposes platinum and platinum alloys have been found least expensive over a long period of time because of excellent resistance to the corrosive influence of the atmosphere and the wear caused by the friction of contact. Platinum changes its size with heat and cold at the same rate that glass does, and, although tungsten has the supremacy in the lead-in wires of commercial lamps, platinum continues to retain its hold on special lamps, such as those used as signal lights on telephone switchboards and others, especially of the vapor type.

Immune to Most Chemicals

PLATINUM finds considerable use in the form of anodes, cathodes and electrodes. Anodes and cathodes are made of sheet platinum and find useful employment in electrolytic separation processes. Electrodes, made of either sheet or wire-gauze platinum, aside from their use in electrolytic plants, are used in vacuum tubes.

The thermo-couples of certain pyrometers are made of rhodium-wire or platinum-rhodium wire. A large proportion of platinum in the aggregate is used in special classes of resistance and fuse wire. Platinum chloride salts play an important part in making ultra-violet and other rays visible. Platinum foil is used on points for lightning rods.

Platinum is immune to the effect of most chemicals, and, therefore, the metal *par excellence* for utensils in the electro-chemical laboratory. More and more electrical manufacturers are establishing research laboratories, and platinum crucibles, retorts, filter cones, tweezers, triangles, etc., are costly, but indispensable in most research work.

Platinum Alloys

BESIDES being alloyed for different purposes with iridium, rhodium and the other metals previously mentioned as associated with it, platinum is also frequently alloyed with gold or silver or both. Telephone contact points are made of a gold, silver and platinum alloy. Silver and platinum combine to furnish accurate service in the silver coulometer, in which a platinum dish containing the solution serves as cathode, the anode being pure silver inclosed in a porous cup. Silver, the best conductor of heat and electricity, by the way, aside from its use for electro-plating, is used in a small way in the form of wire on certain instrument coils, but, like platinum, its electrical use is chiefly in the form of contact points in screw and rivet form.

While sponge, sheet and wire are the ordinary commercial forms of platinum, refiners are usually also workers of the metal and market it for electrical purposes not only in these forms but also in the form of finished contacts.

Present Platinum Prices

TWENTY years ago platinum sold at an average price of $22.85 a troy ounce. During the war the United States Government paid $105 an ounce, and following the Armistice it disposed of some 14,000 ounces at that price level. In 1925 the market stood for a long time at $120. The Soviet spokesmen have let it become known that their object in slashing prices was in part to regain for platinum consumers who turned from the metal to substitutes because of its price. If this policy is adhered to and the use of platinum in jewelry, in which more than half of the output is consumed, should become less fashionable, the electrical uses of this precious metal would undoubtedly expand.

The Rotating Magnetic Poles in Polyphase Motor Stators

The moving field in the induction motor is easily explained by comparison with a motor having salient pole construction on stator and rotor

By R. A. Brady
General Electric Company

FOR the operation of industrial machinery requiring larger than fractional horsepower motors, the two types which predominate are the polyphase induction and synchronous motors. The exception to this rule is found in a field of application where variable speed drive is required, as both the polyphase induction and synchronous motors are essentially constant speed motors. Variable speed, alternating current motors have been developed and successfully applied, but direct current motors are more commonly used for variable speed service.

The induction motor has an advantage over the synchronous motor in that it is cheaper, more rugged in construction, and requires no direct current excitation source. The synchronous motor, however, has a slightly higher efficiency and can be made to operate at unity power factor, or with a leading power factor to compensate for other inductive devices on the same system having a lagging power factor. In the smaller sizes for machine tool drive and general industrial purposes, the induction motor is used because of its simplicity and ruggedness; while for the operation of large pumps, compressors, motor-generator sets, etc., the synchronous motor offers several advantages.

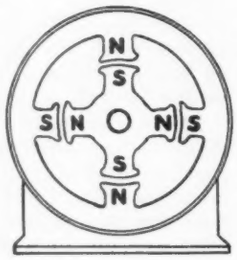


Figure 1. This illustration shows schematically the electrical conditions existing in the synchronous motor

The feature of power factor correction is used advantageously both in the application of synchronous motors and in synchronous condensers, a synchronous condenser being a synchronous motor operated for power factor correction purposes only and not carrying a mechanical load. The starting characteristics of the two motors are similar and both require the same starting equipment except that the synchronous motor starter must have provision for applying the direct current field excitation.

The operating principle of both the polyphase induction and synchronous motor is based on the revolving magnetic field, which is produced by the stator windings; and in the stator construction the two may be identical. A non-technical discussion of the manner in which these revolving magnetic poles are produced by the stationary windings of the stator in a three phase motor is the purpose of this article.

If a motor were to be constructed having a stator frame with electro-magnet field poles similar to a direct current motor and a rotor having the same number of field poles, as illustrated in Fig. 1, it is obvious that if the field coils of both the stator and rotor were excited from a direct current source and the motor frame were made to revolve, the rotor would revolve with it and at the same speed.

In the synchronous motor, the rotor is constructed as shown in Fig. 1 and rotating magnetic poles produced in the stationary stator magnet frame by the polyphase windings, which are electrically equivalent to the conditions described for Fig. 1. In the induction motor the rotor field poles are produced by the induced current in the rotor bars, as will be explained later.

In Fig. 3, a section of a three phase stator winding is illustrated schematically as it would appear if spread out on a surface, the thought being kept in mind that what is shown as a single turn coil is in actual construction a group of coils; but the relative location and over-lapping of the phases is as indicated in the illustration. It will be noted that the coils of the three phases follow in rotation and that the successive coils of the same phase are reversed in direction, giving opposite magnetic polarity. These coils are embedded in slots in the laminated magnet frame of the stator. The magnetic condition which would be obtained in such a group of windings at succeeding time intervals may be studied with the aid of Fig. 2, which shows the direction and magnitude of the current in a three phase system at successive time intervals; the abscissa represents time, and the vertical lines, the time intervals at which a study will be made of the magnetic conditions in the stator.

In checking the polarity of the stator coils for any instantaneous value of phase current, it will be assumed that when the phase current as shown in Fig. 2 is positive, the direction of current flow through the stator coils will be from left to right in Fig. 3. Similarly, when the phase current is negative, the current flow is from right to left. It

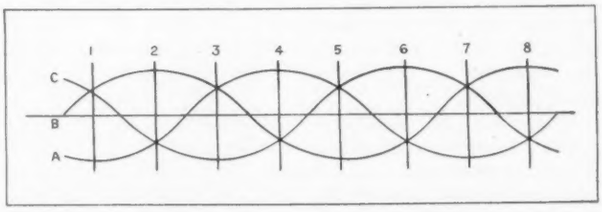


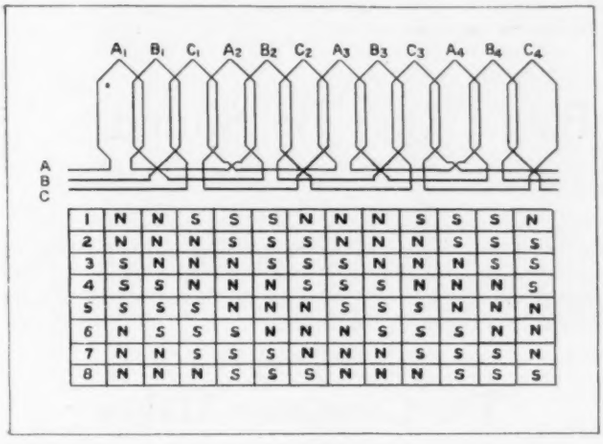
Figure 2. The direction and magnitude of the current in a three-phase winding are shown here. Time is represented on the abscissa. The vertical lines indicate time intervals to be studied

will also be remembered that when the direction of current flow in a coil is counter-clockwise, a north pole will be produced in the end of the coil nearest the observer; clockwise directions of current flow will give south polarity.

With instantaneous current values as given at point 1 of Fig. 2, phase A being negative, the direction of current flow will be from right to left through the coils of Fig. 3, making the polarity of coil A_1 = N, A_2 = S, A_3 = N, and A_4 = S. Phase B is positive with a current flow from left to right

through the coils of Fig. 3, making the polarity of coil B_1 = N, B_2 = S, B_3 = N, and B_4 = S. Phase C is also positive, and the polarity of coil C_1 = S, C_2 = N, C_3 = S, and C_4 = N. This condition as to coil polarity is tabulated underneath each coil for the successive time intervals and is also shown graphically in Fig. 4. Checking then the flux direction at different points on the face of the stator for position 1, it will be noted that coils C_1, A_2, and B_3 form a group, each having south polarity, while coils C_2, A_3, and B_4 form a group having north polarity. It will also be noted from Fig. 2 that the current in phase A is equal to the sum of the currents in phases B and C. The point of maximum flux density for each group of coils will be under coil A, which is in the center of the group.

A fraction of a second later, the current relation of the three phases will have changed to that shown at point 2. Phase C will have reversed from positive to negative, with a change in the polarity of each coil of that phase. Phase B will have increased to a maximum and A will have decreased. Checking again the coil polarities, it will be noted that the position of the coil groups having like polarities has been moved by one coil space toward the right, coils A_2, B_3 and C_4 now making up a group, having south polarity in place of C_1, A_2 and B_3 and coils A_3, B_4 and C_5 making a group with north polarity, and the coil of phase B, which is now maximum, is in the center of the group. Repeating the procedure for point 3, it is to be noted that the coil groups having like polarities have again been moved one space toward the right. Following out the coil polarities for the remaining time intervals as shown in the tabulation of Fig. 3 and the graphical representation of flux direction and magnitude in Fig. 4, we find that these electro-magnetic poles move around the stator at a uniform rate; and if the



1	N	N	S	S	S	N	N	N	S	S	S	N
2	N	N	N	S	S	S	N	N	N	S	S	S
3	S	N	N	N	S	S	S	N	N	N	S	S
4	S	S	N	N	N	S	S	S	N	N	N	S
5	S	S	S	S	N	N	N	S	S	S	N	N
6	N	S	S	S	N	N	N	S	S	S	N	N
7	N	N	S	S	S	N	N	N	S	S	S	N
8	N	N	N	S	S	S	N	N	N	S	S	S

Figure 3. A section of a three-phase stator winding of an induction motor spread out on a plane would have this appearance except that single coils here are actually several turns

rotor is constructed with the same number of field poles as there are magnetic poles in the stator winding, the rotor will be made to rotate in synchronism with the revolving magnetic field in a manner similar to that illustrated in Fig. 1.

It is now evident that a synchronous motor having a rotor with electro-magnet field poles excited from a direct current source is inherently a constant speed motor with its rotor revolving in synchronism with the magnetic poles of the stator. The speed at which any motor will rotate may be readily computed from the formula:

$$\text{R.P.M.} = \frac{\text{Cycles per second} \times 120}{\text{Number of field poles}}$$

In the case of an induction motor having a squirrel cage type of rotor construction, the rotor speed is slightly less than synchronous speed, allowing the rotor bars to be cut by the magnetic lines of force of the revolving magnetic poles of the stator. This difference in speed is known as the slip of the motor and varies from two to seven per cent of synchronous speed, depending upon the load carried. When the rotor bars are cut by the stator flux, there is induced in the short circuited bars an electromotive force and current. This secondary current produces magnetic poles in the rotor,

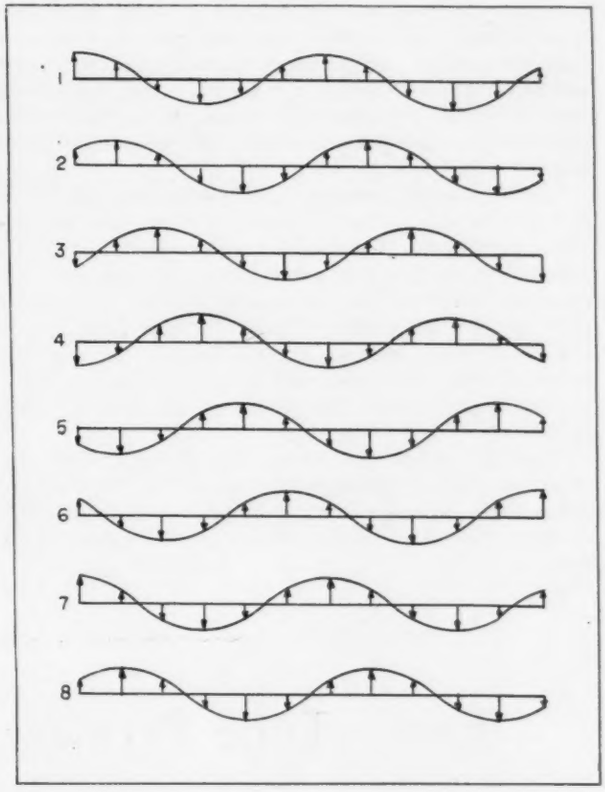


Figure 4. The manner in which the magnetic poles move around the stator are shown in this diagram of the flux direction and magnitude existing at different times in the stator winding

which are attracted by the revolving poles of the stator in a manner similar to that described for the synchronous motor.

The operating voltage of a motor may be readily changed from one value to another, within the range for which the windings are insulated, by a regrouping of the stator coils. In the section of Fig. 3 is shown a number of coils for each phase connected in series. If the entire stator winding were shown, it would probably consist of several such series groups connected in parallel. To reconnect for a different voltage would necessitate increasing or decreasing the number of coils in each series group in direct proportion to the voltage change.

This same method of explanation of the operation of a motor can be applied regardless of the number of phases, since the fundamental reason for rotation of the rotor is the rotating magnetic field set up by the flow of alternating current in the stator windings. In the single phase motor, the rotating magnetic field is also the reason for the rotation after the rotor has reached sufficient speed to overcome core losses and friction, but the rotating magnetic field does not exist with sufficient strength to turn the rotor until it has reached this speed. The field simply alternates on a diameter of the stator and until armature reaction has had a chance to build up sufficiently, the single phase motor will not run. In order to overcome this single phase motors are equipped with starting windings which produce at the start an unbalanced rotating field.

Making Advertising Pay in the Buyer's Market

(*Continued from page* 56)

all transmission is in two parts, the transmitter and the receiver. The post-graduate college and the business paper can organize facts and the relation of facts indefinitely without result unless there exist key men in business—"problem solvers" who connect themselves at the other end of the line to receive. It is a notable fact that among those who have connected up with the line of understanding in the past three years, are some of the greatest "problem solvers" of the business world.

The advertising "problem solver" as a whole has been strangely slow in comprehension of the new conditions—why I cannot tell. It may be that we can find a clue to this situation in the fact that every advertising man who has come has been of the professional not the commercial group since, in the words of Huxley, "a professional man is one who applies science and education to meeting the wants of men," those who work as commercial advertisers and not as professional men do not get the point of adult education.

There are notable exceptions, but the interest in the buyer's market as indicated by inquiries to the Foundation, among business executives in general, is at least five times as great as the interest shown by advertising executives.

12. Understanding of the buyer's market is the new road to business success.

We are, as a whole, working along a road of business today where the ruts are deep, formed by the action of some decades of quantity production. The new road of the buyer's market with the greatest possible opportunities of advance, has turned away from the old road. At the fork of the road some of us are standing to tell the wayfarer who comes along how he can use the new road to come to his destination usefully both to himself and to all he serves. Those who can see, see the new road. Those who can hear the warning, listen and they start in the new way. The blind and the deaf can neither see the road nor hear the warning. Their feet can only feel the ruts and they go forward over the old road. They do not even know that there is another and a better road. Education has nothing to sell men. It only offers a choice. It employs no arguments. It offers no easy way. "Work to gain advance and you will gain it." "Refuse to work and you will lose it." This is all education has to say. The blind and deaf, when offered that choice by education say today as they have said for centuries "I can't see this. It is too deep for me. This is over my head." Those who see and hear say, today, as they have said for centuries, "Help us to learn what to do and how to do it."

Every Time Payment Plan Must Be Sound

(*Continued from page* 83)

pany makes the collections is generally sounder for all concerned, and especially desirable for the factory when it enters into a repurchase agreement, as above recommended.

In the first place, experience proves that a dealer of materially lower net worth can be accepted on such a plan than on a plan whereby the dealer collects. A net worth of $10,000 is usually enough to qualify a dealer under the first plan, whereas $25,000 is usually considered necessary under the second. The holdback and the rates are both higher under the dealer-collector plan. All of which signifies that the finance companies have found the dealer-collection method more than twice as hazardous and that the factory's risk in a repurchase agreement would be more than doubled under such a plan.

An important factor of safety in a plan which provides for finance company collections is the fact that the buyer does not feel justified or safe in withholding payments due the finance company, merely because of some defect, real or imagined, in the instrument or its installation.

Another advantage is the fact that the dealer has no arguments with the buyer over any phase of his account. Questions of extension and the like are all referred to the finance company and the dealer's relations with the buyer remain undisturbed. This direct contact with the finance company is sometimes cited as an objection to the finance company collection plan. But the finance company, with a wealth of experience behind it, can be trusted to use such contact as a means of acquiring good will, both for itself and for the manufacturer that uses its service.

Experience fully justifies the holdback of 10 per cent as a reserve against default by the dealer in meeting his endorsement if the buyer becomes delinquent. This assures better cooperation by the dealer.

The Consumer Makes the Decision

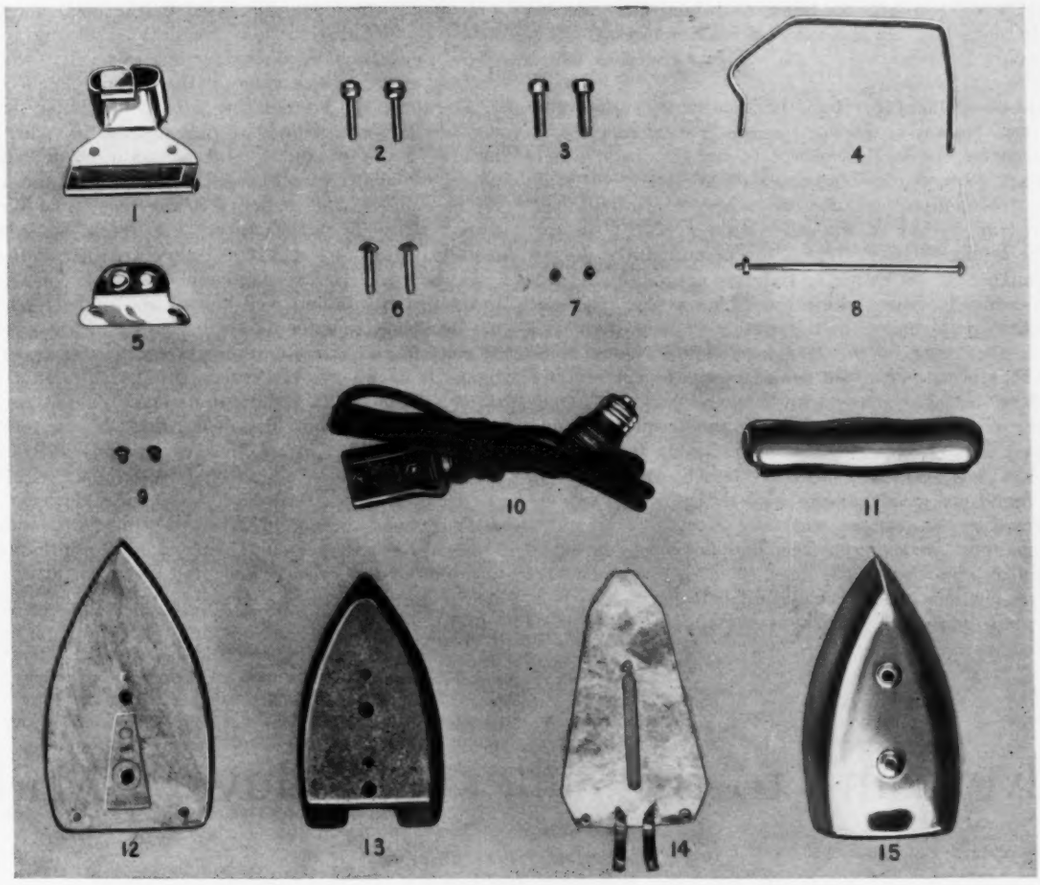
(*Continued from page* 95)

present themselves in stirring and impressive form. It must be an idea big enough and forceful enough to have some chance of bringing back returns commensurate with the cost of getting it into the public consciousness.

In the third place there must be absolute certainty that the way is clear for a translation of this interest, once aroused, into sales of wiring, current, appliances, supplies, and all those other outward evidences of that "useful idea" of increased use of electric adjuncts to living which is the foundation of the whole enterprise. Public interest can be stirred if the message is worthy and the transmission of it intelligent, but one other query that needs settlement in advance is: "What will happen then?" Who will be ready to take this interested consumer in hand and in good faith carry out, in the consumer's own interest, all the promises that may be made or that are implied in the stirring of a desire for more use of electric helps to living?

Electric Iron Components

The total of 2,936,000 electric irons manufactured in 1925, based on an estimated average retail price of $5 has a valuation of $15,000,000



ELECTRICAL MANUFACTURING *acknowledges the assistance of the Ideal Service Company, Inc., 57 Walker St., New York, N. Y., in the preparation of the illustration of the electric iron parts. The figures for the total production of irons in 1925 is that given by the Department of Commerce Bureau of Statistics*

Are you supplying your share of the raw materials and parts required for the total annual production of

2,936,000

electric irons, the number produced in 1925?

Part No.	Description	Material	Annual Production
1	Rest	Steel	2,936,000
	Name plate	Brass	2,936,000
	Name plate rivets	Brass	5,872,000
2	Connection posts	Brass	5,872,000
	Nuts	Steel	11,744,000
	Washers	Steel	5,872,000
	Insulating washers	Mica	14,680,000
3	Base screws	Steel	5,872,000
4	Handle support	Steel	2,936,000
5	Connection post support	Steel	2,936,000
6	Handle support screws	Steel	5,872,000
7	Element connection screws and washers	Steel	5,872,000
8	Handle bolt and nut	Steel	2,936,000
9	Rest screws	Steel	5,872,000
10	Attachment cord set	Wire, plugs	2,936,000
11	Handle	Wood	2,936,000
12	Sole plate	Steel	2,936,000
13	Weight	Cast Iron	2,936,000
14	Heating element	Wire, mica, brass	2,936,000
15	Shell	Steel	2,936,000

Eliminating Hazards in Electrical Materials

(*Continued from page* 63)

are not made. Under the present arrangement, fees and costs are divided into four groups, ranging from a preliminary fee of $100 and a total cost not to exceed $300 to a group in which the preliminary fee is but $15 and the total cost not more than $45. In a fifth group provisions are made for investigations, the cost of which may exceed the $100 preliminary fee and the $300 maximum cost. This is to provide for researches upon subjects covering which records are not available.

In addition to the foregoing, the Laboratories also offer what it terms follow-up service, re-examination service, inspection service and label service. In the first case, whenever reports of appliances or materials are ready to issue, the favorable opinion, promulgated as heretofore described, is followed up by one of the other three types of service. Under the re-examination service, the manufacturer during the continuance of the listing as standard agrees to pay certain fees annually, with which the Laboratories pays the cost of obtaining samples, in the market or elsewhere, and making further tests of the appliance one or more times yearly. This is to enable the manufacturer to correct any sub-standard features subsequently, should any be found. The inspection service includes regular and frequent examinations and tests of appliances or materials at factories by Laboratories' engineers and the correction by the maker of features found not in compliance with the standards of efficiency shown by the samples originally tested.

The remaining form of supervision is known as the label service and is regarded as the most efficient and acceptable of the three methods of supervision. It is being utilized to a greater extent each year. This service consists of inspections of appliances and material at the factories by Laboratories' engineers and the labeling of standard products by stamps or labels, whereby they may be recognized wherever found. In addition, this form of service offers systematic supplementary examinations and tests at the Laboratories of samples of goods purchased in the open market or received from inspectors or users, thus serving to countercheck the efficiency of the factory inspection work and to determine the service value of the product.

As can be appreciated, the costs of this latter service vary considerably, according to the amount of work and the nature of the product. And, in addition to carrying the names of manufacturers regularly employing the label service in each separate industry in the records of the Laboratories, all such manufacturers are freely consulted in all matters concerning standards of construction and inspection.

From the electrical standpoint, the work of the Laboratories is generally so well known and understood that it is not necessary to enter into a discussion of the great number of electrical products it embraces, as the scope of the investigations have now been extended to cover practically everything in use of an electrical nature. And a review of a year's work in this one department of the organization would disclose an astonishing variety of tests. All to the end that any person not thoroughly familiar with the many possibilities of misbehavior of electrical devices when not carefully and wisely designed, a study of Underwriters' Laboratories' tests would bring a new impression of the meaning of the words, "approved electrical fitting," and of all the efforts of the Laboratories to make electrical installations safe.

Advertising to the Seller in a Buyer's Market

(*Continued from page* 66)

are obsolescent a few weeks after they start on their road trips. The only way a manufacturer with a rapidly changing line of goods can post all of his dealers quickly is through the pages of the industry's business press.

This style of advertising can be used advantageously even where only occasional changes or additions are made to a line. The National Lead Company recently used this kind of advertising most forcefully in announcing its new soft, easily-mixed lead to the retail trade.

11. *Sampling a new product to the trade.*—It may not be possible to get a retailer to order by mail an untried product, but it is possible to get him to send for a free sample. If he likes the sample, it is not hard to get him to stock a trial shipment of it.

This method of opening up new retail accounts works so smoothly that it is surprising that more manufacturers do not use it. It is used to a considerable extent in the grocery business and with amazingly satisfactory results.

12. *Tying the trade into one large enthusiastic family.*—Manufacturers often forget that their dealers are allies who nearly always fight alone. The manufacturer usually has only one dealer in a community. As a rule he knows nothing about that manufacturer's dealers in other communities. How much better that dealer would feel if he knew what other dealers are doing with that manufacturer's goods in other communities.

Some manufacturers go to the tremendous expense of holding conventions of dealers. The purpose is that the dealers may get acquainted and catch enthusiasm from one another. An enthusiasm breeding convention of this sort can be held monthly in the advertising pages of the industry's business papers at a fraction of what a flesh-and-blood convention would cost.

The chain stores are finding that one of the weaknesses in their system is that they are not tied closely enough together. Many are starting house magazines, the purpose of which is to interchange ideas among managers and to make the good discoveries of some stores the common practice of all stores.

Manufacturers can interchange ideas of this kind among their dealers without going to the trouble and expense of publishing a house magazine. They will find the business papers made to order for their purpose. Among the manufacturers who have used this kind of trade appeal with notable results are Hart Schaffner & Marx, the clothing manufacturer, and The Hoover Company.

New Goods—for Your Inspection

A department for the description of new devices, parts, materials and special tools for use in the manufacture and repair of electrical products

Switch Plug for Irons

Rodale Mfg. Co., 200 Hudson St., New York, announces production of a switch plug for electric flatirons. It is completely encased by a steel coat of armor, which furnishes protection against breakage, and, being nickel in finish, harmonizes with the iron.

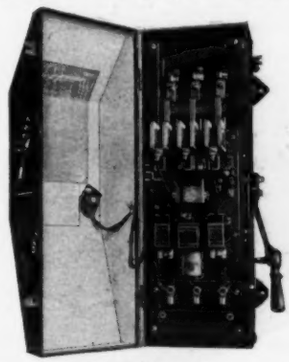
Resistance Strip

Polymet Mfg. Corp., 599 Broadway, New York City, is marketing resistance strips equipped with soldering and mounting lugs. These resistances are wound

on flat insulating strips, illustrated, or on flexible non-inductive tubing and covered with an insulating sleeve. These units are light and are designed for use where a low current-carrying capacity of resistance of low ohmage is required. Flat strips are made in all sizes from 1 to 2000 ohms. Flexible resistances are made in all sizes from 1 to 5000 ohms.

Resisto-Transformer Starter

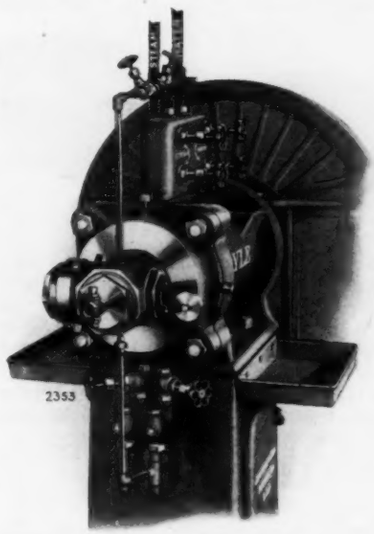
Allen-Bradley Co., 493 Clinton St., Milwaukee, Wis., have added Bulletin 648 Resisto-Transformer starter to their line of motor starters. The new model is a combination of the graphite compression



resistor and the autotransformer (compensator) types of starters, designed to obtain stepless acceleration with low current input. Large squirrel-cage motors can be started without causing line voltage jolts, or dimming lights connected in the same network. The compression resistors are connected in series with the autotransformer, when the motor is connected to the line, thus preventing an initial current inrush. These resistors permit acceleration of the motor from standstill to full speed without opening the line connections to the motor.

Insulating Machine

John Royle & Sons, Paterson, N. J., have placed on the market an insulating machine, Model No. 2, of medium size and well adapted to insulating wire from No. 14 up to about ¾ in. diameter. Actual production on No. 14 code wire is from about 150,000 to 200,000 feet per day. The machine drives by electric motor in most installations, there being a choice of drive



through spur gears or an automatically oiled and cooled worm gear unit. It operates by a revolving steel stock screw which masticates and compresses the plastic stock within the cylinder, forcing it forward upon the core as both emerge through a forming die. Essential correlated parts are the diehead and fittings, thrust bearing of the screw, driving gears, circulatory system for controlling the temperature of the stock in process, and the supporting column or base.

Celoron Molding Macerated

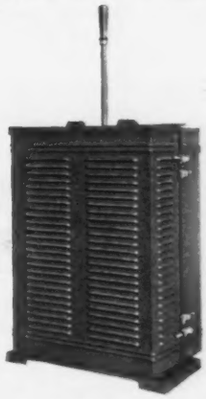
Celoron Co., Bridgeport, Pa., has developed a molding material, known as Celoron Molding Macerated, which may be used for molding parts subject to great mechanical stresses as well as electrical. Molding Macerated is made of fabric impregnated with Celoron resin and macerated into different size pieces according to the requirements of the trade. It gives a high glossy finish when molded.

Productimeter

Durant Manufacturing Company, 655 Buffum Street, Milwaukee, Wis., has brought out a general service productimeter, Model No. 5-DD-1, for use on such devices as paper cutters, folders, printing presses, vegetable and food packers, light duty conveyors, scales, and small drill presses. It is small but the figures are large and legible. It is equipped with bronze bushings which are easily replaced at low cost, and the driving sleeve is designed to prevent racing of counter at high speeds. The drive shaft and pinion of the device are exceptionally large. The drop forged operating lever can be set at any angle, convenient for application to the machine. It is equipped with a quick resetting feature, a single turn of the wing nut instantly brings the numerals back to zero.

Heavy Duty Controller

Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, announces the Dinkey controller for heavy duty. In its construction ebony asbestos replaced slate, and the frame is welded steel. Ventilated contacts are raised 9/16 in. from the dial and contact segment supporting-lugs are attached to the front of the dial, being also removable from the front. Instead of two fillister head screws, a single square-head, cup-pointed set screw is used in each



terminal lug, tightly clamping the lead wire. The main arm of the controller is carried on ball bearings, the quadrant bearing being a graphite-bronze bushing. The bearing-spider casting supports the main and quadrant bearings and asbestos dial, insuring rotation of the contact fingers in a plane parallel with the contact segments, and guaranteeing even contact pressure. The controller has a one-piece cover for back and sides, provided with ventilating louvres.

Textolite Laminated

General Electric Co., Schenectady, N. Y., has placed on the market Textolite Laminated, which is composed of thin non-metallic sheets impregnated with a synthetic resin. This material is available in sheet, rod, and plate form. Special shapes may be had on short notice.

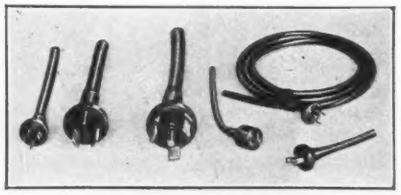
Power Undercutter

Ideal Commutator Dresser Co., Sycamore, Ill., has brought out an improved power mica undercutter designed for both large or small commutators. It is designed to undercut without taking down any brush rigging, thus permitting immediate slotting. The device is equipped with a micrometer adjustable guide, reducing the

number of slots to be cut by hand. An easily adjusted depth gauge is also included. Heat treated gears are used, and a tight cover, which prevents grease from running out or mica dust from getting in. The motor has end bearings so that it can be hung in any position and does not have to be set level.

Attachment Plugs

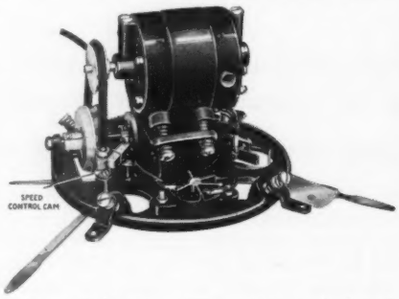
Resilient Terminals Co., 88 Tenth St., Oakland, Cal., has produced the Unicord attachment plug which combines the plug and cord in such a manner that the necessity of assembling is eliminated. All of the units are bonded into rubber with the



connections soldered so that there are no screws or rivets to work loose. This complete sealing process renders the product vapor and liquid proof and reduces to a minimum the possibility of wires working loose and causing a short circuit. Terminals at both ends and lengths of cords are supplied according to specifications.

Electric Phonograph Motor

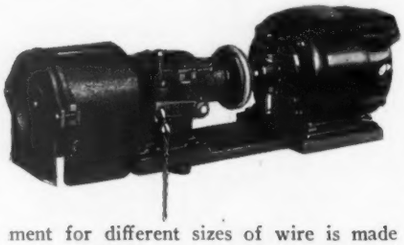
Studner Bros., 67 W. 44th St., New York, announces the Johnson-Gordon motor for electric reproduction. It is a universal motor operating on either D.C. or A.C. (25 and 60 cycles), with high starting torque insuring correct turntable speed and an improved governor insuring even turntable r.p.m. even when the line



voltage fluctuates. The motor is designed for use with any phonograph, new or old, as it is mounted on an iron plate composing a single unit.

Hartman Wire Stripper

Service Sales & Mfg. Co., 3429 W. 126th St., Cleveland, has placed on the market the Hartman wire stripper, which twists and polishes the wire as it strips off the insulation. It is designed for the use of manufacturers of radio sets, wired fixtures, armature winders, etc. The adjust-



ment for different sizes of wire is made entirely from one externally operated screw. Two sizes of this machine are available, Model A for wire of 0-3/8 in. diameter over the insulation and Model B for wire 1/4 to 3/4 in. It is furnished with a 110-volt A.C. motor but D.C. motors or motors of other voltages may be obtained on order.

Cable Slitter

F. R. Zierick Machine Works, 6 Howard St., New York, has brought out a cable slitter for cutting the outer braid on double cable wires. The machine is operated by

a foot pedal, the slitting process being performed by inserting the wire or cable, pressing down the foot pedal and pulling the cable out of the jaws.

Molded Hard Wood

Braylite Moulding Corporation, 109 Hudson St., Jersey City, N. J., has produced Braylite, a material having the characteristics of hard wood which can be molded to shape, being particularly well suited to production of handles for electric appliances. It possesses considerable strength, is water resisting, and can be machined or sawed like wood. Braylite can be drilled and will take a wood screw, but, unlike wood, it will not split as it has no grain. It possesses the insulating qualities of wood.

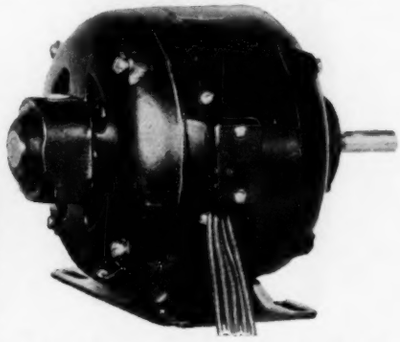
Buffer and Compact Condensers

Aerovox Wireless Corp., 70 Washington St., Brooklyn, N. Y., has added three types of compact condensers to its line. Types 270, 470, and 1070 are non-inductively wound, thoroughly impregnated, and sealed in round fibre tubes. The terminals provide a convenient means for mounting the condenser or subpanels or directly to binding post terminals. They are suitable for use in circuits where small capacities of from .01 to .1 mfd. are required. Aerovox has also brought out four new types

of buffer condensers. Types 446, 646, 1046 and 1546 (illustrated) are connected across the secondary windings of power transformers designed for use with gaseous type rectifiers. The units consist of two non-inductively wound 0.1 mfd. sections connected in series and provided with a center tap.

G. E. Capacitor-motor

General Electric Co., Schenectady, N. Y., has developed the capacitor-motor embodying, in a compact and coordinated design, the features desired by power companies and manufacturers of appliances, a motor having high efficiency and power-factor and requiring low starting current. The motor has an external capacitor for con-



nection in series with one phase. It has a wound stator and a squirrel-cage rotor. A centrifugally operated switch is mounted on the rotor. No commutator or brushes are used. The bearings are waste-packed and of liberal capacity.

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of **ELECTRICAL MANUFACTURING** is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of **ELECTRICAL RECORD** as heretofore. This Classified Index has been an exclusive **ELECTRICAL RECORD** feature for over thirty-six years.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
AMMETERS. See Instruments.
ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Blowers. See Blowers, Armature.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.
ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.
ARMORING MACHINES. See Wire Manufacturing Machines.
ARMS, FLEXIBLE. See Tubing Flexible Metallic.
ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville, Inc., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Deceleco, Inc., Wayne, Mich.
Federal Insulating Corp., Yonkers, N. Y.
Johns-Manville, Inc., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zellite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Pittsburgh Valve & Fittings Co., Barberton, Ohio. (Cast Iron.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.

BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 317 E. 29th, Chicago, Ill.
Braun Bearings Co., Primos, Pa.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton.
Schubert. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Arguto Oilless Bearings Co., Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., Cleveland, Ohio.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Mechanical Devices Co., Aurora, Ill.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. P. B. See Mechanical Devices Co.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
P. O. B. See Mechanical Devices Co.
Reliance. See Metal Saw & Machine Co.
Selb Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.

BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.

BOX BOARD
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago.

BOXES, Fibre
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago.
BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., Front & Willow Sts., Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 309 Decatur, Sandusky, Ohio.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O. (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.
National Folding Box Co., New Haven, Conn. (Cartons.)
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.
Thompson & Norris Co., 212 Concord, Brooklyn, N. Y.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, (Div. of General Cable Corp.), Baltimore, Md.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Dallas Brass & Copper Co., 1812 New Orleans, Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

BREAKERS, Circuit. See Circuit Breakers.

BRIDGES, Wheatstone. See Instruments, Laboratory Standard.

BRONZE. See Brass, Bronze and Copper; also Castings.
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.
BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W
Automotive Mfg. Co., Kansas City, Mo. ..... H
B. B. B. See Becker Bros. Elec'l Corp.
Baylis Co., Bloomfield, N. J. ..... H
Becker Bros. Elec'l. Corp., 23 N. Jefferson, Chicago, Ill. ..... C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. C
Boston Woven Wire Brush Co., Northboro, Mass. ..... W
Boxill-Bruel Carbon Co., Columbus Park, O. C ..... H
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. C
Carbon Engrg. Co., Slinger, Wis. ..... C L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O. C
Carbon & Graphite Products Co., 227 West Broadway, New York, N. Y. C
Caranco. See Carbon Engineering Co.
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y. ..... C W S L
Columbia Machine Wks., & M. I. Co., 283 Chestnut, Brooklyn, N. Y. ..... H
Cooley Mfg. Co., 98 Park Place, New York .. W
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City C
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 310 York Ave., Philadelphia, Pa. ..... H
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa. C
Eureka Copper Products Corp., North East, Pa. ..... W S H
Flock Carbon Co., 508 Broome, New York C
General Electric Co., Schenectady, N. Y. .... C ..... H L
Graphalloy. See Graphite Metallizing Corp.
Graphite Metallizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. ..... C ..... H
Henrite Products Co., 98 Park Place, New York, N. Y. C
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio ..... H

BRUSHES, Commutator—Continued
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) ..... C .....
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. ..... C .....
Kohtenite Products Co., 417 W. 28th, New York, N. Y. ..... C .....
La Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 3608 Grand Central Terminal, New York, N. Y. C .....
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C .....
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y. ..... C .....
National Carbon Co., Cleveland, O. ..... C .....
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W ... L
Ohio Elec. Specialty Mfg. Co., Troy, O. ..... W .....
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C .....
Pure Carbon Co., Wellsville, N. Y. ..... C W S .. L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... W ... L
Salem Electrical Supply Co., Salem, Mass. .. W .....
Seabury, Ralph L., Factories Bldg., Toledo, O. C .....
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C .....
Spee-Dee Elec. Mfg. Co., 190 Lafayette, New York, N. Y. ..... C L
Speer Carbon Co., St. Mary's, Pa. ..... C .....
Stackpole Carbon Co., St. Mary's, Pa. .... C .....
Sterling. See Carbon Laboratories Co.
Superior Carbon Products, Poughkeepsie, N. Y. ..... C .....
U. S. Graphite Co., Saginaw, Mich. ..... C .....
Unico. See Universal Carbon Co.
Universal Carbon Co., Dundee, Ill. ..... C .....
Universal. See Graphite Metallizing Corp.
Weber Elec. Wks., Brooklyn Sts., Cleveland. C L

BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits.

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.

SUNCHING MACHINES. See Wire Manufacturing Machines.

BUSHINGS, SHAFT. See Bearings and Bushings.

CABINETS, Ice Cream. See Refrigerator Cabinets.

CABINETS, Fibre

Diamond State Fibre Co., Bridgeport, Pa.
Vulcawood. See Diamond State Fibre Co.

CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 555 W. Monroe, Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 72 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Diamond C. See Standard Elec. Supply Co.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Box & Switchboard Co., 500 S. Thorp, Chicago.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Electric Apparatus Co., 702 N. Halsted, Chicago, Ill.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dall Mfg. Co., 606 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2906 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
MacMillen, John W., 201 N. Los Angeles, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Renloh. See Holzer Sheet Metal Works.
Security. See Aurora Steel Products Co.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
States Elec. Mfg. Co., 703 Plymouth Ave., N., Minneapolis.
Superior Switchboard & Devices Co., 420 Schreyer Ave. Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 144 Bleecker, Newark.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Ampere. See Donehue Lumber Co.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Roehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carolina Wood Products Co., Asheville, N. C.

Die Castings

Aluminum, Tin, Lead and White Brass, Special Machines, Dies, Tools, Jigs and Stampings

Advance Tool & Die Casting Co.
1654-60 Holton St., Milwaukee, Wis.
Edgewood 284

Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Clinton Corp., 342 Madison Ave., New York, N. Y.
Crescent Chair Co., Plymouth, Wis.
Delker Co., Geo., Henderson, Ky.
Donehue Lumber Co., Smith and State, Perth Amboy, N. J.
Effein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
King Mfg. Corp., Rano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
National Cabinet Co., New Philadelphia, O.
Natural Voice Talking Mach. & Radio Cabinet Co., Oneida, N. Y.
New England Box Co., Greenfield, Mass.
Ottawa Furniture Co., Holland, Mich.
Parker-Young Co., 131 State, Boston, Mass.
Pierson Co., 836 Cedar, Rockford, Ill.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pillied Lumber Co., Swanton, O.
Radio Master Corp. of America, Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Rockford Sales Corp., 306 Lexington Ave., New York, N. Y.
Schutz Bros., 152 Chambers, New York, N. Y.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Stradivara Co., Coshocton, Ohio.
Straus Cabinet Wks., Eugene, Baxter Ave., Louisville, Ky.
Stettner Phonograph Corp., 318 E. 75th, New York.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo.
West Box Co., 235 Liberty, Springfield, Mass.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines.

CABLE TEST SETS. See Instruments, Portable and Switchboard.

CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington, Del.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Phoenix Glass Co., 230 5th Ave., New York, N. Y.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.

CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.

CARTONS. See Boxes and Wrappers.

CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum. Also
Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh, Pa.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.
McGill Metal Co., Valparaiso, Ind.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave., Cincinnati, O.

Sterling Art Metal Wks., 40 Purvis, Long Island City, N. Y.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

CASTINGS, Die

Advance Tool & Die Casting Co., 1654 Holton, Milwaukee, Wis.
Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
American Die Casting Co., 2049 Dominick, Chicago, Ill.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Illinois Die Casting Co., 551 W. Congress, Chicago, Ill.
Milwaukee Die Casting Co., 239 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., New Haven, Conn.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
North Wales Mach. Foundry Co., North Wales, Pa.
Snead & Co., Pine St., Jersey City, N. J.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark, N. J.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Armstrong. See Electric Power Maintenance Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Electric Power Maintenance Co., 21 N. Third, Minneapolis.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plus Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., S. 116 Sheridan Sq., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain

Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Thermold. See Technical Products Co.

CHAIN, Chandelier (Fancy). See Crystals, Chandelier.

CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Javiton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.
Waterbury Mfg. Co., Waterbury, Conn.

CHAIN, Power Transmission

American High Speed Chain Co., 221 E. South, Indianapolis.
Baldwin Chain & Mfg. Co., Worcester, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Head Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.

CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Serrwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 LaSalle, Chicago, (Oxide.)
Eimer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
New Jersey Zinc Co., 160 Front, New York, N. Y. (Zinc Chloride.)
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 236 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 833 Summer St. (South Boston), Boston, Mass.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee.

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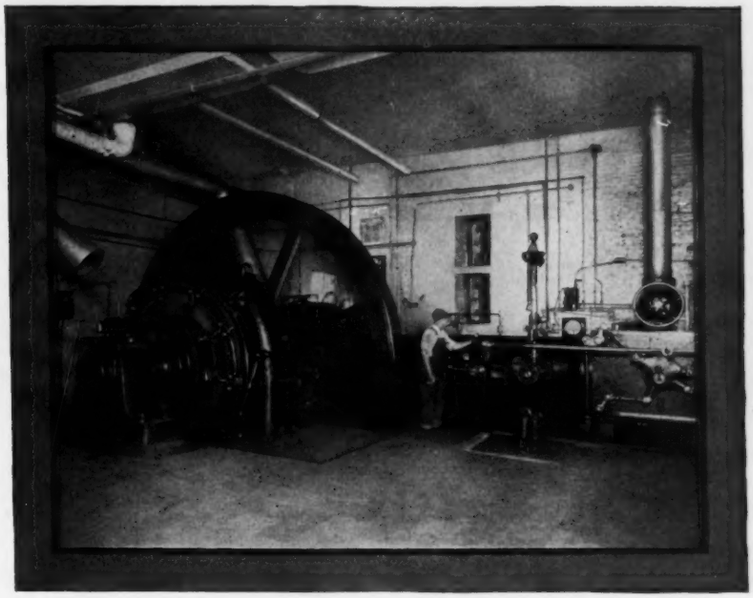

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Circuit Breakers—Continued
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Schenectady, N. Y.
Inducto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Ward Leonard Elec. Co., Mount-Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CIRCUIT TESTERS. See Testers, Fuse and Circuit.
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal
Oakite Products, Inc., 26 Thames, New York, N. Y.

CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug
Gray Bros. Co., Plano, Ill.

CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.

CLOTH UNTREATED
Walker Cotton Fabrics Co., 327 S. La Salle, Chicago, Ill. (Cotton Duck)

CLOTH AND PAPER, Insulating

Cloth, Insulated ..... See C									
Paper, Insulated ..... See P									
Fibre Paper (Fish Paper) ..... See F									
Press Board (Fuller Board) .... See B									
Silk ..... See S									
Acme Wire Co., New Haven, Conn.		C	S	P					
Armatite. See Mica Insulator Co.									
Brand & Co., Wm., 268 Fourth Ave., New York					P				
Campbellite. See Campbell Fibre Co.									
Campbell Fibre Co., Stanton, Delaware									B
Carboloid Products Corp., 15 Park Row, New York, N. Y.		C			P				B
Case Brothers, Inc., Highland Park, Conn.									
Case & Risley Press Paper Co., Oneco, Conn.									
C-P. See Campbell Fibre Co.									
Celoron Co., Bridgeport, Pa.					P	F			B
Chicago Mica Co., Valparaiso, Ind.		C							
Dexstar. See Dexter & Sons.									
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)					P				
Diamond State Fibre Co., Bridgeport, Pa.					P				
Dielectric Mfg. Co., St. Louis, Mo.		C	S	P					B
Federal Insulating Corp., Yonkers, N. Y.		C			P	F			
General Electric Co., Schenectady, N. Y.		C			P				
Hewitt & Bros. C. B., 16 Ferry, New York		C			P				
Hi-Tex. See Stevens Paper Mills.									
Incella. See Tarentum Paper Mills Co.									
Irvington Varnish & Insulator Co., Irvington, N. J.		C	S	P					
Manning Paper Co., J. A., Troy, N. Y.									B
Mica Insulating Co., 200 Varick, New York		C	S	P					B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.					P				
National Vulcanized Fibre Co., Wilmington, Del.						F			
New Jersey Wood Finishing Co., Woodbridge, N. J.		C							
Ohmoid. See Wilmington Fibre Specialty Co.									
Old Hick. See Hewitt & Bros., C. B.									
Peerless. See National Vulcanized Fibre Co.									
Rogers Fibre Co., 210 Lincoln, Boston, Mass.						F			
Rogers Paper Mfg. Co., South Manchester, Conn.									B
Schweitzer, Peter, 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)									
Seutan Co., 342 Madison Ave., New York					P				
Sico. See Standard Insulation Co.									
Spaulding Fibre Co., Tonawanda, N. Y.						F			
Standard Insulation Co., Rutherford, N. J.		C	S	P					
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varnished Hard Fibreboard)									B
Sterlite. See Sterling Firebrand Co.									
Stevens Paper Mills, Windsor, Conn.									B
Tarentum Paper Mills Co., Tarentum, Pa.					P				
Turbonite. See Brand & Co., Wm.									
Union Mills Paper Mfg. Co., New Hope, Pa.					P				
West Virginia Pulp & Paper Co., 200 5th Ave., New York									B
Wilmington Fibre Specialty Co., Wilmington, Del.					P				

CLUTCHES, Magnetic
Cutler-Hammer Mfg. Co., Milwaukee, Wis.

COIL (Coils).
Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.

Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished
Armature, Field, Electromagnet and Induction Coils.
Acme Products Co., 22 Elkins (South Boston), Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York, A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Colilton Elec. Mfg. Co., Easton, Pa.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 27th & Sanderson Sts., Camden.
Electrical Products Mfg. Co., Providence, R. I.
Irvington Varnish & Insulator Co., Irvington, N. J.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 226 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Robertson, Lee F., 536 West 22nd St., New York, N. Y.
Sevison Magneto Engrg. Co., 397 Phillips, Toledo, O.
Stunz & Barron, 210 E. Pratt, Baltimore, Md.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Universal Winding Co., Boston, Mass.
U. S. Armature Service Co., 1617 S. Michigan Ave., Chicago, Ill.
Whittier & Ditmar, Inc., 1611 Beacon, Brookline, Mass.

COMMUTATOR
Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS
Derby Commutator Co., Derby, Conn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.

COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electric Service Sundh Elec. Co.
Diamond Elec. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 292 Hudson, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Co., H., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
U. S. Elec'l Mfg. Co., 200 E. Slauson Ave., Los Angeles.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.

COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.

CORES, RESISTANCE COIL (Lava)
American Lava Corp., 1425 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)
American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Fireite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreosil. See Thermal Syndicate.

COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

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COUPLINGS, Shaft (Flexible-Insulated)
Bartlett Hayward Co., Baltimore, Md.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Franke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 319 W. Ohio, Chicago, Ill.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease
Bowen Products Corp., Auburn, New York.
Lunkenheimer Co., Cincinnati, Ohio.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier
Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 268 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia.
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA
Meyercord Co., 133 W. Washington, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled
Whittier Co., Horace R., Pequabuck, Conn.

DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS
Baumbach Mfg. Co., 1810 S. Kilbourn Ave., Chicago, Ill.
Beaver Mfg. Co., 325 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.

DISCS, Armature
Steel Discs, Laminations, and Segments for Motors and Transformers.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.

DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)
(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES
Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Luma Elec. Equipment Co., 407 Spitzer Bldg., Toledo, O.
Preis & Co., Inc., H. P., Newark, N. J.

ENGRAVING, Radio Panel
Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., Newark, N. J.
Roselle Mfg. Co., 215 E. 9th Ave., Roselle, N. J.
Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati.
Wright Radio Co., 114 Exchange, Rockland, Mass.

ENGRAVING TO ORDER. See Engraving, Radio Panel.

EYELETS
Platt Bros. & Co., Waterbury, Conn.

FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.
FEET, FELT. See Felt.

FELT
Advance Felt & Cutting Co., 317½ S. Jefferson, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4031 Ogden Ave., Chicago, Ill.

This ancient Genoese watch tower near Bastia, France, has proved its powers of resistance against enemies, elements and the tooth of Time. Proportionately, our fibre shipping boxes also resist abuse because built with judgment.

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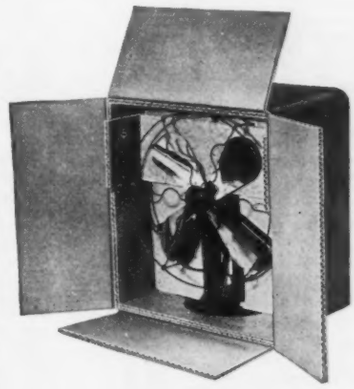
Strength, toughness, endurance—these factors are more than ever a requirement by shippers in fibre shipping boxes. "These boxes must stand up" and face rough-house tactics without giving way. They must carry safely and far, and protect such items as veneered doors, automobile bumpers, fragile glassware and vases, lamp shades, mattresses, rugs, enameled tile, perishable fruits, meats and vegetables, delicate instruments—and thousands of varieties of goods that fifty years ago were packed by obsolete methods into impractical boxes.

Naturally we must keep step with the advance all along the line. We MUST know every phase of Industrial fields—and we DO know them. It is our business to build with judgment, hence we fit our boxes to the needs and peculiarities of each industry as you would a glove to your hand or a shoe to your foot. Knowing each field, we "prescribe" accordingly. The result is shipper's satisfaction because he saves from 30% to 70% of former packing and shipping expense, and whittles down troubles to a new minimum.

Boxes built with judgment serve you best. Therefore we can offer you the FREE service of our expert box designers to help you improve and reduce your packing methods and costs. Their special, thorough knowledge and judgment is yours without obligation. It is an opportunity to help your business you cannot well afford to pass up. Fill in and mail coupon today.



High, strong resilient corrugations form a powerful wall of resistance and defence against transportation abuses.

CONTAINER CORPORATION
OF AMERICA
AND
MID-WEST BOX COMPANY

111 W. Washington St. CHICAGO, ILLINOIS

Six Mills—Nine Factories Capacity 1200 tons per day

RETURN COUPON

CONTAINER CORPORATION OF AMERICA
111 West Washington Street, Chicago, Dept. 36

Gentlemen: Please have one of your experts check our present packing and shipping methods—without obligating us—for the purpose of reducing our costs if possible.

Name _____

Title _____

Firm _____

Address _____

FERRULES
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)
Container Corp. of America, 111 W. Washington, Dept. 36, Chicago, Ill.
Mid-West Box Co., Dept. 6, 111 W. Washington, Chicago.
Sefton Mfg. Corp., 59 E. Madison, Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol
Moisture Proof; Sheet, Rod, Tubes.
Bakelite-Dilecto. See Continental Fibre Co.
Bakelite-Duresto. See Spaulding Fibre Co.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Campbellite. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa.
Continental Fibre Co., Newark, Del.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Inc., Tonawanda, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized
Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Agasote Millboard Co. (Fernwood), Trenton, N. J.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Conite. See Continental Fibre Co.
Cocheco. See Spaulding Fibre Co.
Continental Fibre Co., Newark, Del.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Diamond State Fibre Co.
Diamond State Fibre Co., Bridgeport, Pa.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Agasote Millboard Co.
Fibro Products Co., New Bedford, Mass.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 5403 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 216 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Diamond State Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Sirian Wire & Contact Co., 255 Sherman Ave., Newark.
Suter & Nuetsi, 3709½ Lisbon Ave., Milwaukee, Wis.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1264 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps.. H
American Chain Co., Bridgeport, Conn. (Loops and Rings.).. B
American Pin Co., Waterbury, Conn.. I
American Ring Co., Waterbury, Conn. (Candle.).. S
Ampinco. See American Pin Co.
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill.. B I
Arco. See American Ring Co.
Arrow Electric Co., Hartford, Conn.. S
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit.. B
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York.. B
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.).. B I
B. & L. Metal Stamping Co., 155 Jamaica Ave., Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.).. B I .. H
Cambridge Brass Co., Cambridge, Mass.. B
Cleanezy. See Dunlap Co.

FIBRE—*cut to any form*
Sheet, Rod, Tubing
MICA
VARNISHED CLOTH
COTTON TAPES AND SLEEVING
Everything for the Motor
Send for New Insulation Catalogue
THE CONSUMERS RUBBER CO
CLEVELAND 1302-4-6 ONTARIO ST. CHICAGO 329 WRIGLEY BLDG.

Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J.. B S
Crescent Brass Mfg. Co., Reading, Pa.. B
Crouse-Hinds, Solvay Sta., Syracuse, N. Y.. S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.).. B I
Dunlap Co., John, Carnegie, Pa.. S
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y.. B
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill.. B I S H
Flaherty Co., M. E., 28 S. Clinton, Chicago.. I
Fralick Co., S. R., 15 S. Clinton, Chicago.. I
Franklin Brass Foundry Co., Reading, Pa.. B
Friedley-Voshardt Co., Chicago.. B
Full-O-Lite Co., 50 Dey, New York, N. Y.. B
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O.. I
Hart & Hegeman Mfg. Co., Hartford, Conn.. S
Incandescent Supply Co., 468 West Broadway, New York, N. Y.. B H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Lanco Mfg. Co., 228 Jelliff Ave., Newark, N. J. (Cross Bar.).. I
Liberty Brass Turning Co., 203 Lafayette, New York, N. Y.. I
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y.. B I
Liberty Machine Co., Wauwatosa, Wis.. B I
L. & K. Mfg. Co., 440 Adelphi, Brooklyn, N. Y.. H
L. & W. Brass Wks., 820 Orleans, Chicago, Ill. B
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y.. I
Macallen Co., Foundry St., Boston, Mass.. I
Metal Products Co., 210 Canal, New York.. B
Metro Iron Ornament Co., 191 Christie, New York, N. Y.. I
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y.. B
Midwest Elec. Co., 1639 Walnut, Chicago, Ill.. I
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo.. B
Michell-Vance Co., 70 Washington, Brooklyn, N. Y.. S
Monarch. See Perfecelite Co.
Murlin Mfg. Co., Philadelphia, Pa.. B I
National Electric Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.).. I
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O.. H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y.. B
Nobolt. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa.. I
Onli. See Perfecelite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. B S
Peerless Products Line, 5612 First Ave., Baltimore, Md.. H
Perfecelite Co., 1457 E. 40th, Cleveland.. S
Pittsburgh Valve & Fittings Co., Barberton, O.. I
Plume & Atwood Mfg. Co., Waterbury, Conn. B S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Reading Brass Co., 141 Schiller, Reading, Pa. B I
Rodale Mfg. Co., 200 Hudson, New York.. B H
Sandow Tool Co., 1440 Bway, New York, N. Y.. S
Scovill Mfg. Co., Waterbury, Conn.. B I
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Smoot-Holman Co., Inglewood, Cal. (Ceiling Reflectors).. B
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia. B
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y.. S
Standard Metal Spinning Co., 128 Mott, New York, N. Y.. B
Star. See Perfecelite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa.. I
Steele & Johnson Mfg. Co., Waterbury, Conn. B S
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.).. B
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York.. I
Triumph Mfg. Co., 310-13, West New York, N. J.. S
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.

The Simplex Refillable
FUSE PLUG
The plug that can be refilled with standard fuse wire.
F. W. POWELL
119 W. Ohio St., Pittsburgh, Pa.

United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y.. B
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O.. B
Walden Tool & Metal Mfg. Co., New Haven Conn.
Wa-Me-Co. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn.. B
Waterbury Mfg. Co., Waterbury, Conn.. B S
Waterbury Metal Wares Co., Waterbury, Conn.. S
Weber Brass Co., Whitney Power Block, Cleveland, O.. B
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y.. B S
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal.. B
Zamora. See American Pin Co.

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) (Flashing Plugs.)
California Sign Flasher Co., 706 Russia, San Francisco, Cal.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Sign Flasher Corp., 1626 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 292 Hudson, New York, N. Y.
Hotchkiss. See Cramblet Engineering Corp.
Jewel Elec. & Mfg. Co., 4505 Ravenswood Ave., Chicago, Ill.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Magnetic Sign Flasher Co., Seattle, Wash.
Mercury. See Betts, Inc., James H.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Puritan Elec. Circuit Breaker Corp., 1 E. 42nd, New York.
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.
FLEXIBLE SHAFT. See Tubing, Flexible Metallic.

FORGINGS, Non-Ferrous
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Culyer, Brooklyn, N. Y.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Timberlake & Sons, J. B., Jackson, Mich.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

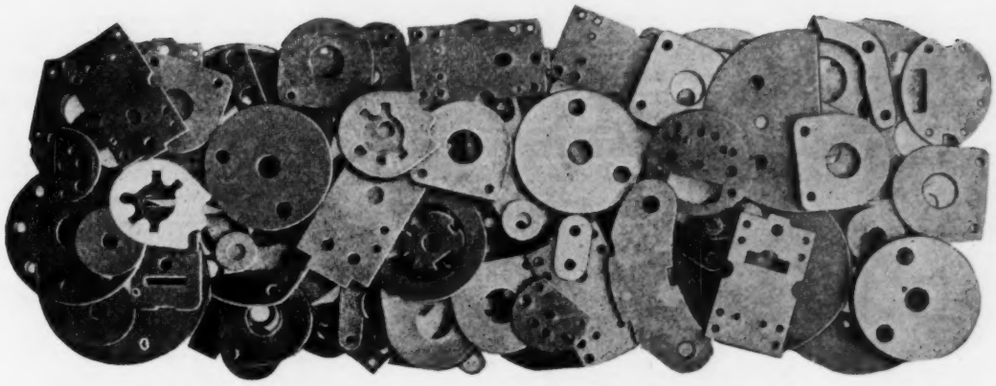
FUSE CLIPS
Sherman Mfg. Co., H. B., Battle Creek, Mich.

FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

	KEY
Cartridge	See C
Plug	See P
Non-Refillable	See N
Refillable	See R
Open Link	See O
Fuse Wire	See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J.. P
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Co., Hartford, Conn.. P N
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa.. P
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis.. C P N R O
C. E. Z. See Automatic Elec. Iron & Fuse
Chase-Shawmut Co., Newburyport, Mass.. C P N R O



PUNCHED PARTS OF FIBROC

"Stronger than Fiber—More Durable than Rock"

Some of the many products in which FIBROC is used as an insulator, in the form of either sheets, rods, tubes or special punched parts.

Automobiles
Automobile Ignition
Battery Chargers
Battery Parts
Bells and Signals
Burglar Alarms
Coils
Controls
Dynamos
Electrical Appliances
Electric Machinery
Electrical Instruments
Electric Fans
Fire Alarms
Heat Regulators
Ignition (Oil Burners)
Instrument Boards
Insulators
Lighting Plants
Magnets
Motors (Electric)
Plating Machinery
Radio
Railroad Equipment
Regulators
Signal Systems
Signs
Switches
Telephones (Automatic)
Toasting Apparatus
Telegraph
Transformers
Vacuum Cleaners

and new uses being found every day.

For manufacturers that prefer to purchase their requirements of punched parts finished and inspected at the FIBROC factory, we maintain a completely equipped punch press department and a corps of expert die makers who are specialists in this work. Many customers have found that by purchasing their parts finished and ready for assembly they are able to effect worthwhile economies.

FIBROC will withstand a puncture voltage of from 450 to 750 volts per mil of thickness, and a piece ⅛ inch thick has a tensile strength of 11,000 pounds per square inch. FIBROC is heat resistant, is impervious to moisture, oil and chemical fumes, and will not crack, warp nor shrink —it will not change dimensions. For instance—

FIBROC "BP"

Punching Grade

Water Absorption (total immersion)	1/10%
Change in Gauge	.001
Dielectric Strength	450 volts per mil
Tensile Strength	11,000 lb. per sq. in.

FIBROC in all its grades is subject to the same machining operations common to wood or metal.

For many years FIBROC has satisfactorily met the requirements of manufacturers of small insulating parts of various sizes and designs. Particularly is this true where unusual mechanical strength as well as dielectric strength is desired.

FIBROC "GR" is the only self-lubricating silent gear material on the market.

FIBROC is furnished in sheets, strips, rods and tubes to meet practically any specification.

FIBROC INSULATION CO.
245 LINCOLN AVE. VALPARAISO, IND.

FIBROC

Some of the many products in which FIBROC is used mechanically, either in sheets, rods or tubes or punched or machined parts.

Blowers
Coffee Grinders
Conveyors
Creamery Machinery
Dental Machinery
Elevators
Flour Mills
Friction Discs
Gears: Spur, Bevel, Worm
Grain Cleaners
Grinders
Hydraulic Machines
Ice Machinery
Lathes
Locomotives
Mine Machinery
Motor Bus Parts
Oil Burners
Oil Pumps
Photographic Machines
Printing Presses
Pulleys
Pumps
Scales
Shock Absorbers
Steam Shovels
Transmissions
Valves
Ventilators
Washing Machines
Windshield Wipers

and new uses being found every day.

SALES OFFICES IN PRINCIPAL CITIES

FUSES AND FUSE WIRE—Continued
Chicago Jefferson Fuse & Electric Co., 1505 W. 15th St., Chicago, Ill..... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C . . N R . .
Cote Bros. Mfg. Co., 182 W. Lake, Chicago C P . . R . .
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh ..... C . . . . R . .
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill..... C P N R . .
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va.. C P N R . .
Elliott Electric Co., Shreveport, La..... . . . . . .
Gem. See Chicago-Jefferson Fuse & Electric
General Electric Co., Schenectady, N. Y..... C P N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C . . . . . .
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y..... C . . . . R . .
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. . . P . . R . .
Hudson Wire Co., Ossining, N. Y..... . . . . O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y..... C P N . . O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill..... C . . . . . .
Merrill Mfg. Co., 50 State, Boston, Mass.. . . . . .
Monarch Fuse Co., Jamestown, N. Y..... C . . N R . .
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y..... C P . . R . .
Platt Bros. & Co., Waterbury, Conn..... . . . . O
Powell, F. W., 119 W. Ohio, Pittsburgh.. . . P . . R . .
Ree-Nu-It Elec. Co., New Bedford, Mass.. C P . . R . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y..... C . . . . R . .
Royal Elec. Co., Chelsea Station, Boston.. . . P N . . . .
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . R . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N R . .
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING

Cattie & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

GALVANOMETERS.. See Instruments, Laboratory Standard.

GAS INERT

Helium Co., Louisville, Ky.
Palstine Industrial Co., 111 Fifth Ave., New York, N. Y.

GASKETS, Rubber

Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.

GAUZE BRUSHES, Wire. See Brushes, Commutator.

GEARS, Fibre. See Gears and Pinions, Composition.

GEARS (Speed Changing Units)

Cleveland Worm & Gear Co., Cleveland, Ohio.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Co., R. D., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Philadelphia Gear Wks., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Celoron Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Diamond State Fibre Co., Bridgeport, Pa.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago,
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Earle Gear & Machine Co., Wayne Junction, Philadelphia.
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Perkins Machine & Gear Co., 120 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GEARS AND PINIONS, Rawhide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Gerdes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis.

GENERATORS, Electroplating. See Plating Generators.
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture.
GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Berylite. See Plaut & Co., L.

Camia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Decora. See Macbeth-Evans Glass Co.
Delfen-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletieco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kauffeld Glass & Ceramic Co., Star City, W. Va.
King-Tutankhamen. See Macbeth-Evans Glass Co.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
MacBeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
Marbe. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Melilite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.
Pastelle. See Consolidated Lamp & Glass Co.
Pearltone. See Inland Glass Co.
Persian. See Gillinder & Sons, Inc.
Phene. See Phoenix Glass Co.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasco. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaco, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestepal. See Gleason-Tiebout Glass Co.
Quezal Glass Mfg. Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utonia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Reiter, G. C., Canton, O.
Waterbury Mfg. Co., Waterbury, Conn.

GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5344 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
ICE CREAM CABINETS. See Refrigerator Cabinets.
IMPREGNATING COMPOUNDS. See Wax and Compounds.
IMPREGNATING, VACUUM. See Ovens, Industrial.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.

INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Ossining, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Engley Laboratory, Newport, R. I. (Standard Cells.)
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Simplex. See Leeds & Northrup Co.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa.
Vawter. See Thompson-Levering Co.
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., Garrison Place and French St., Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tiffany Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., 136 Liberty, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Ossining, N. Y.
Crit-Point Meters. See Illinois Testing Laboratories.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Appliance Co., 99 Broadway, Paterson, N. J.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Ground-Ohmer. See Sticht & Co.
Hickok Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
Jaynes, R. F., Lynn, Mass.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn N. Y.
Multi-Volt Trouble Finder. See Weiford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pin-Jack. See Weston Elec'l Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Sticht Co., H. H.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Superkeen Company, Salisbury, N. C.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thomspon-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Trinlex Meters. See Roller-Smith Co.
3 In 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Weinberg & Co., 870 Blue Island Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.

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INSULATION—Continued
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint and Varnish.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS
Artos Engrg. Co., Milwaukee, Wis.

INSULATION MIXERS
Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy
Diamond State Fibre Co., Bridgeport, Pa.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Macallen & Foundry, Boston, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass
For Composition Jars. See Molded Insulation; also Rubber.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Rodefer Glass Co., Bellaire, O.
Sneath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing
Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.
Universal. See Oefinger, J. L.

JOINTS, Fixture Insulating
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Macallen & Foundry, Boston, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White & Co., O. C., 17 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.
LACQUER, ARMATURE. See Paint, Varnish and Lacquer, Metal. See Paint, Varnish and Lacquer.
LAMINATIONS. See Discs, Armature.
LAMP BASES. See Bases, Reading Lamp.
LAMP BULBS (Unfinished). See Bulbs, Glass.
LAMP FILAMENTS. See Filaments, Incandescent Lamp.
LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.
LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES
(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.
LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.
LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES
Sign Letter, Flashlight, Projector and Reflector.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Clinton Sign Co., Clinton, Ia.
Consolidated Lamp & Glass Co., Coraopolis, Pa. (Flashlight)
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Gilligan Glass Products Co., New Philadelphia, Ohio.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Lig. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Lights Co., 30 W. 15th, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)

LETTERS, Sign
Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 652 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs. Inc., 2736 Wentworth Ave., Chicago, Ill.

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Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature
Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

LININGS, Socket
Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.
LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.

LOUD SPEAKERS
Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
Air-Chrome. See Temple, Inc.
Aristocrat Corp. of America, 115 W. 23rd, New York, N. Y.
Associated Radio Corp., Ann Arbor, Mich.
Balsa Wood Reproducer Corp., 331 Madison Ave., New York.
Borkman Radio Corp., 152 E. Seventh, S. Salt Lake City, Utah.
Brielle. See Penn Mfg. Co.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Double Duty. See Aristocrat Corp. of America.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 42nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fergus Co., 235 Elizabeth Ave., Newark, N. J.
G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 338 N. Kedzie Ave., Chicago, Ill.
Lata Isalsa. See Balsa Wood Reproducer Corp.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Co., 191 Joralemon, Brooklyn, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products, 219 W. Chicago Ave., Chicago, Ill.
Mozart-Radioceive. See Fergus Co.
Newcombe-Hawley, Inc., St. Charles, Ill.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powertone Elec. Co., 222 Fulton, New York, N. Y. (Kit.)
Puropower. See Platter Cabinet Co.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Radio Cabinet Co., 2118 Gale, Indianapolis, Ind.
Raliotive Corp., 21st Ave. and 53rd, Brooklyn, N. Y.
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swoboda Co., Maritime Bldg., Seattle, Wash.
Teletone Corp. of America, Third St. & Van Alst Ave., Long Island City, N. Y.
Temple, Inc., 1925 S. Western Ave., Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Vitalitone Radio Corp., 88 University Place, New York.
Wonderphone. See Universal High-Power Telephone Co.
Woolf, J. W. & W. L., 227 Fulton, New York, N. Y.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper
Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

	KEY
Luminous Compound	See C
Pendants (Bulbs)	See P
Standard Parts	See S

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Bryant Electric Co., Bridgeport, Conn..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S
Cutler-Hammer Mfg. Co., 1238 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y..... P
General Electric Co., Schenectady, N. Y..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman Mfg. Co., Hartford, Conn..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luna Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C P
Reynolds Spring Co., Jackson, Mich..... S
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia.. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y. ..... C S P

MACHINE SCREWS. See Screws, Machine.
MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES
Armature Banding. See Banding Machines, Armature.
Armature Notching. See Notching Machines, Armature.
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making.
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

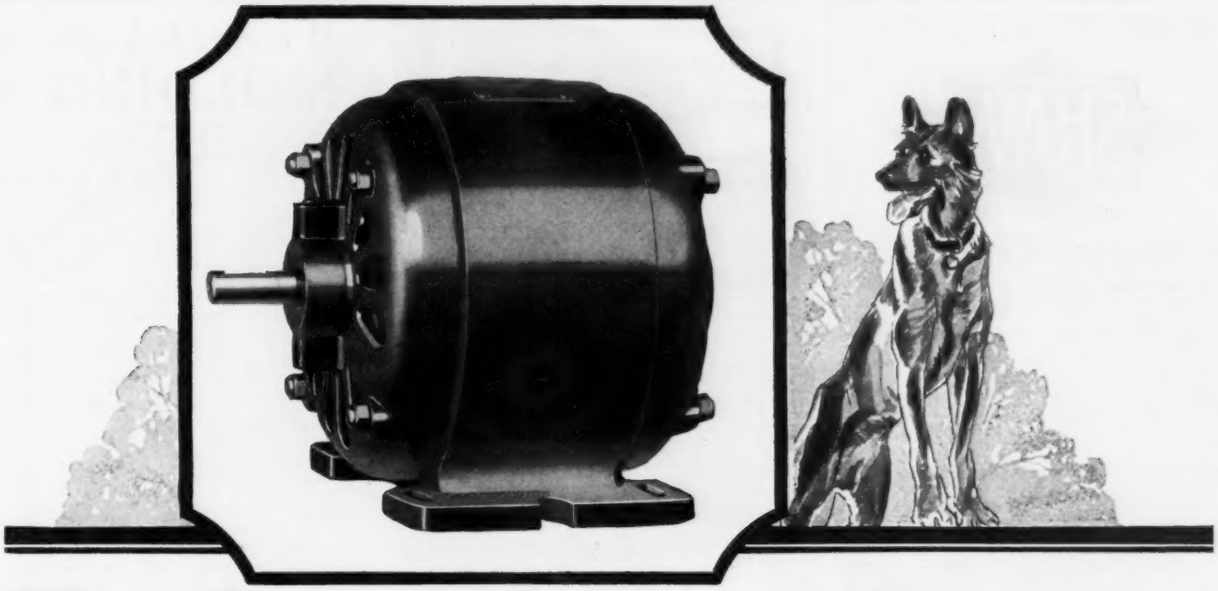
MACHINES, Lamp Making
For Making Incandescent Lamps and Vacuum Tubes.
Arrow Mach. Co., 527 Hackensack Plank Rd., Union City, N. J.
Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass. (Vacuum Pumps.)
Dwyer Machine Co., Lynn, Mass.
Elsler Engineering Co., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York, N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines.
MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.
MAGNET CHARGERS. See Chargers, Magnet.
MAGNET STEEL. See Steel, Magnet.
MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.
MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.
MAGNETIC CHUCKS. See Chucks, Magnetic.
MAGNETIC CLUTCHES. See Clutches, Magnetic.
MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent
Bulleas Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chica.
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Stitch & Co., H. H., 13 Park Row, New
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.

MANGANESE, Battery. See Chemicals, Battery.
MEASURING INSTRUMENTS. See Instruments.
MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.
MEGOHMMETERS. See Instruments, Laboratory Standard.
MERCURY SWITCHES. See Switches, Mercury.
METAL CLEANERS (Compound). See Cleaners, Metal.
METAL CUTTING OUTFITS. See Welding and Cutting Outfits.
METAL FINISHING. See Plating & Finishing.
METAL MARKING OUTFITS. See Engraving Machines.
METALLIC SHADES. See Shades, Metallic.
METERS. See Instruments.
MICA SHADES. See Shades, Mica.
MICA TAPE. See Tape, Mica.
MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA
Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Dielectric Mfg. Co., St. Louis, Mo.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 14 Lispenard, New York, N. Y.
Hirsch Mica Co. 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa.
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Macallen and Foundry, Boston, Mass.
Micabond. See Chicago Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Minerals & Insulation Co., 101 Spring, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemeo. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K, 804 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp.)



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Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 179 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.

MIXERS, INSULATION. See Insulation Mixers.

MOLDED

Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.

MOLDED INSULATION

Alco. See American Insulator Corp.
Alden Mfg. Co., Brockton, Mass.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., 420 Lexington Ave., New York.
Amerine. See American Insulator Corp.
Asbeston Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Braylite Moulding Corp., 109 Hudson, Jersey City, N. J. (Wood Composition.)
Celoron Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Compo Products Corp., 222 Passaic, Passaic, N. J.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimco. See Dayton Insulating Moulding Co.
Durex. See General Plastics, Inc.
Durite. See Stokes & Smith Co.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Everecoil. See Bakelite Corp.
Federal Insulating Corp., Yonkers, N. Y.
Fedrelin. See Federal Insulating Corp.
Fenoline. See Insuline Corp. of America.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 76 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Hercules Powder Co., Wilmington, Delaware.
Herculite. See Colosta Co.
Huetter-Premier Machine Co., 7215 Livernois Ave., Detroit, Mich.
Hi-Heet. See Insulation Mfg. Co.
Hi-Tensit. See Boonton Rubber Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Improco. See Insulation Products Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., 404 Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Elyria, O.
Isolantite Co. of America, Inc., Bellville, N. J.
Johnson Molding & Tool Co., Weymouth, Mass.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Keystone Specialty Co., 2373½ Coventry Rd. (Lakewood), Cleveland, O.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Lavamix. See Splitdorf Radio Corp.
Macallan Co., Macallan and Foundry Sts., Boston, Mass.
Mack Molding Co., Little Falls, N. J.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
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Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Renite. See Nixon Nitration Works.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Splitdorf Radio Corp., Newark, N. J.
Star Insulate. See Insulation Mfg. Co.
Starlite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synamix. See Garfield Mfg. Co.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

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Elkon, Inc. (Div. of P. R. Mallory Co.), Portchester, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.

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International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches, Snap (Heavy Duty).

MOTORS

Alternating Current ..... See S
Direct Current ..... See S
Motors, 1 Hp. up ..... See M
Motors Fractional Hp. ..... See F
Universal ..... See U

Ace. See A. C. Dayton Co.
A. C. Dayton Co., 308 E. 1st, Dayton, O..... F S ..
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland M ..
Actodector. See Roth Bros. & Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis..... M .. S ..
Allis Co., Louis, Milwaukee, Wis..... M .. S ..
American Brown Boveri Elec. Corp., Graybar Bldg., New York, N. Y..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis..... M ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M ..
A. R. S. See Westinghouse Elec.
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago..... F S U
Bogue Elec. Co., Chas. J., 132 King, New York M ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O..... M F ..
Burke Elec. Co., Erie, Pa..... M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 812 Lafayette, Toledo, O..... F ..
Cah. See Westinghouse Elec. Mfg. Co.
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S ..
Chandeysson Elec. Co., St. Louis, Mo..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. ..... M ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O. ..... M .. S ..
Cleveland Elec. Motor Co., 5213 Windsor Ave., Cleveland, O. ..... M F S ..
Colonial Fan & Motor Co., Warren, O..... M F S U
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind. ....
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cushman Elec. Co., Concord, N. H..... M F S ..
Day-Fan Electric Co., Dept. A, Dayton, O..... F S ..
Diehl Mfg. Co., Elizabeth, N. J..... M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O. ..... S U
Dumore. See Wisconsin Elec. Co.
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. ....
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J..... M .. S ..
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo..... M F S U
Engberg's Elec. & Mechl. Works, St. Joseph, Mich. ..... M .. S ..
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., Chicago, Ill..... M F .. ..
Fidelity Elec. Co., Lancaster, Pa..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn..... .. F ....
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. ..... F .. S ..
General Elec. Co., Schenectady, N. Y..... M F S U
Gilbert Co., A. C., New Haven, Conn..... .. F .. U
Hamilton Beach Mfg. Co., Racine, Wis..... .. F S U
Hobart Bros. Co., Troy, O..... M .. S ..
Holtzer-Cabot Elec. Co., 125 Amory, Boston... M F S ..
Howell Elec. Motors Co., Howell, Mich..... M .. S ..
Ideal Elec. & Mfg. Co., Mansfield, O..... M .. S ..
Imperial Electric Co., Akron, O..... M .. S ..
Janette Mfg. Co., 556 W. Monroe, Chicago..... .. F S ..
Jantz & Leist Elec. Co., Cincinnati, O..... M F ....
Jeanin Electric Co., Toledo, O..... M F S ..
Kan-Dor Elec. Co., 1821 E. 59th, Los Angeles M .. ....
Kendrick & Davis Co., Lebanon, N. H..... .. F S ..
Kimble Elec. Co., 634 N. Western Ave., Chicago M .. S U
King Elec. Co., 35 Murray, New York..... M .. .. ..
Knapp Elec. Corp., Portchester, N. Y..... .. F S U
Leland Elec. Co., Dayton, O..... .. F S ..
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O..... M .. .. ..
Mando Co., Syracuse, N. Y..... .. F .. ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marble-Card Elec. Co., Gladstone, Mich..... M .. .. ..
Master Electric Co., Linden and Master Aves., Dayton, O. ..... M F S ..
MC. See General Electric Co.
Metergram. See Bodine Elec. Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
Northwestern Elec. Co., 408 S. Hoyne Ave., Chicago, Ill. ..... M .. S ..
Northwestern Mfg. Co., 480 Clinton, Milwaukee M .. .. ..
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio .... F S ..
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Pan. See Chandeysson Elec. Co.
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Ra-Lite. See Acme Elec. & Mfg. Co.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. ..... M .. S ..
Reynolds Electric Co., 2650 W. Congress, Chicago .. F S ..
Robbins & Myers, Inc., Springfield, O..... M F S U
Rochester Elec Products Corp., Rochester, N. Y. M .. S ..
Rotator. See Bodine Elec. Co.
Roth Bros. & Co., Chicago, Ill..... M .. S ..
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J..... M .. S ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal..... M .. S ..
Stow Mfg. Co., Binghamton, N. Y..... M F S U
Sturtevant Co., Boston, Mass..... M F S U
Sunlight Electrical Mfg. Co., Warren, O..... .. F S ..
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Triumph Elec. Corp., Carthage, O..... M .. S ..
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles ..... M .. S ..
Usemco. See U. S. Elec Mfg. Co.
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. ..... M .. S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. ..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va..... M .. S ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., R. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., Cincinnati, O..... M .. S ..
Wisconsin Elec. Co., 59 16th, Racine, Wis..... .. F .. U
Woods Mach. Co., S. A., Boston..... M F S ..
W-P Corp., Cairo, Ill..... .. F S ..
Zobell Elec. Motor Co., Garwood, N. J..... M .. S ..

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American Name Plate Co., 117 Imlay, Brooklyn, N. Y.
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Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
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Etching Co. of America, 1520 Montana, Chicago, Ill.

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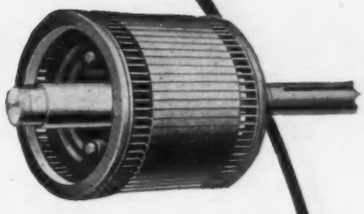
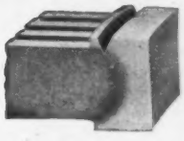
Name Plates

Springfield Mass.

Note the weight of frame, broad heavy feet and compact construction.



Short, thick shaft; rotor bars and end rings fused into a unit; ventilated core.



A section of the rotor windings —bars and end rings. Note the complete fusion of the metals. The rotor on every F-M squirrel cage motor has an inspection groove cut in each end ring to make certain of complete solidity.

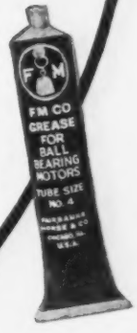
The *inevitable reaction* to PRICE!

The inevitable reaction to price is a separation of buyers into those who can afford to purchase on a price basis and those who cannot.

To those men of industry who know motors—who know that the difference in performance of motors is far greater than the difference in price—who judge and buy motors from a quality standpoint—the Fairbanks-Morse Ball Bearing Motor has always been a "buy."

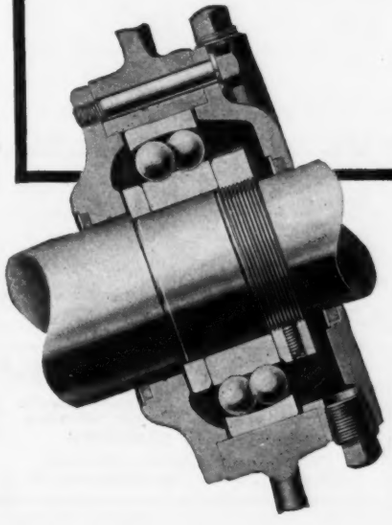
For this motor is built without compromise. Check it point by point—inspect the superb *mechanical* construction which enhances its *electrical* dependability.

A few of these points are described on this page. An interesting booklet, "Fairbanks-Morse Motors in all Kinds of Service" awaits your address.



Once-a-year lubrication

Self-sealing ball bearings require lubrication but once a year. This is further simplified by F-M Measured Grease Lubricant in tubes.



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Waterbury Button Co., Waterbury, Conn.

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Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y.
Seymour Mfg. Co., Seymour, Conn.
United States Nickel Co., New Brunswick, N. J.

NOTCHING MACHINES, Armature

Ferracute Machine Co., Bridgeton, N. J.

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OIL-LESS BEARINGS. See Bearings, Oil-less.

OSCILLOSCOPES. See Instruments, Laboratory Standard.

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Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas. See Thermo Elec. Instrument Co.
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General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
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Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Milbo Co., 717 Sycamore, Cincinnati, O.
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Sargent & Co., E. H., Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Simplex Elec. Heating Co., 85 Sidney, Cambridge, Mass.
Snead & Co., Jersey City, N. J.
Standard Elec. Stove Co., Toledo, Ohio.
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Swartwout Co., 18523 Euclid Ave., Cleveland, O.
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Westinghouse Elec. & Mfg. Co., Mansfield, O.
Young Bros. Co., 6500 Mack, Detroit, Mich.

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Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof..See P
Lacquer, Metal Finishing ..... See L

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Acme Wire Co., New Haven, Conn. V
Acmewire. See Acme Wire Co.
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
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American Lastite Co., 3166 Lincoln Ave., Chicago. .. P L
Antakwa Co., 1329 Mohawk, Chicago, Ill. ..... P
Apexior. See Dampney Co. of America.
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-O-Craft. See Southwestern Paint & Varnish Co.
Atlantic Chemical Co., Colt, Irvington, N. J. L
Atom Chemical Co., 96 E. 10th, New York, N. Y. L
Bakelite Corp., 247 Park Ave., New York, N. Y. L
Belden Mfg. Co., 2310B, S. Western Ave., Chicago
Benolite Co., 501 Columbia Bank Bldg., Pittsburgh. V P ..
Berry Bros., Leib & Wight, Detroit, Mich. V
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V
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Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P ..
Carboloid Products Corp., 15 Park Row, New York. V P ..
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P ..
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzens, Columbus, O. V
Comulac. See Martindale Elec. Co.
Dampney Co. of America, Boston, Mass. V
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P ..
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del.. .. P ..

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Eclipse Paint & Mfg. Co., Cleveland, O. ..... P ..
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Egyptian Lacquer Mfg. Co., 90 West, New York. L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O. L
Federal Insulating Corp., Yonkers, N. Y. ..... V P ..
Flex-lb-lac. See Dielectric Mfg. Co.
Franche & Co., 440 Orleans, Chicago, Ill. L
General Elec. Co., Mds. Dept. Bridgeport, Conn.. V P ..
General Plastics, Inc., 76 Walck Rd., N. Tonawanda, N. Y. V
George Co., P. D., St. Louis, Mo. V
G. E. See General Elec. Co.
Glidden Co., Cleveland, O. ..... V P L
H. B. See Maas & Waldstein Co.
Hercules Powder Co., Wilmington, Del. V
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P ..
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Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
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Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P ..
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. ..... V P ..
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. V
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
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M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P ..
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O'Brien Varnish Co., South Bend, Ind. ..... V P L
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Ozite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
Pacoria Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. L
Peerless. See Maas & Waldstein Co.
Prozlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. .. P L
Republic Varnish Co., 200 Thomas, Newark, N. J. V
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P ..
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Rockbestos Products Corp., New Haven, Conn.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn. V
S. P. C. See Ruberoid Co.
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Sherwin-Williams Co., Cleveland, O. ..... V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. L
Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo. ..... V P ..
Standard Flexible Comp. Co., Franklin Trust Bldg., Philadelphia, Pa. ..... V P ..
Standard Insulation Co., Rutherford, N. J. V
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. ..... P ..
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa. V
Toch Bros., 443 4th Ave., New York ..... V P L
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2098. See Mitchell-Rand Mfg. Co.
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Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P ..
Vulcan-Lastite. See American Lastite Co.
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Waipole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill. L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P ..
Zapon Co., Stamford, Conn. L
Zellac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. L

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Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard.

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Candles. See Candles, Fixture.
Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

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General Electric Co., Schenectady, N. Y.
Kino-Lamp. See Raytheon Mfg. Co.
Photion Instrument Corp., 574 Southern Blvd., New York,
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Raytheon Mfg. Co., Cambridge, Mass.
Westinghouse Elec. & Mfg. Co., Mansfield, Ohio.

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Foote, Pierson & Co., 160 Duane, New York, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
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Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
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Pan. See Chandeysson Elec. Co.
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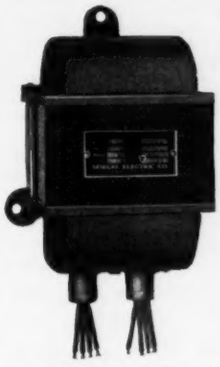

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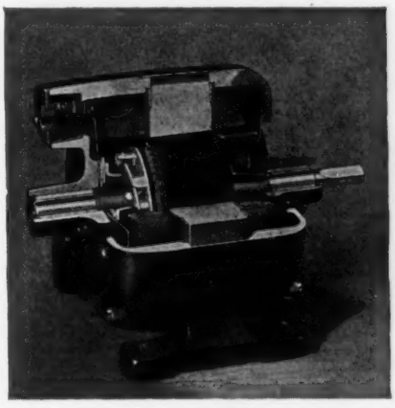

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Heetach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Imperial. See Consolidated Gas Iron Co.
Iona Co., Los Angeles, Cal.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Jiffy. See Esler Elec. Mfg. Co.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 252 Lafayette, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Suitzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York.
U. S. Electric Co., 311 Chambers, Trenton, N. J.
Utilo Mfg. Co., 320 E. Liberty, Lancaster, Pa.
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Iona Co.

POCKET METERS. See Instruments, Pocket.

POINTS, Contact
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum, Silver.)
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory & Co.), Portchester, N. Y.
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Independent Contact Point Co., 545 39th, Union City, N. J.
Interstate Products Corp., 29 Commercial, Newark, N. J. (Platinum and Silver.)
King Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y. (Platinum.)
National Contact Co., 33 W. 60th, New York. (Platinum.)
Nishoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
R. & H. Platinum Works, 709 Sixth Ave., New York.
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes
Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Carey Ohio Porcelain Co., Carey, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Parker, J. H., 296 Broadway, New York, N. Y.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y.
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard Porcelain Co., Leetonia, O.
Standard & Specialty Porcelain Co., Sun Prairie, Wis.
Star Porcelain Co., Muirhead St., Trenton, N. J.
Thomas & Sons Co., R., Lisbon, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

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Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding
Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
Kling. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman Co.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil
Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation
Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 329 W. Water, Syracuse.
Elmes Engrg. Works, Chas. F., 222 N. Morgan, Chicago, Ill.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill.
Farquhar Co., A. B., York, Pa.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.

Stokes Mach. Co., F. J., 5834 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y.
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding
Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching
Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y.
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y.
Dunning & Boschert Press Co., 329 W. Water, Syracuse.
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 200 Varick, New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.

PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft
Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition
General Electric Co., Schenectady, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Sprucolite Co., Bloomfield, N. J.

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Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Mechanical Devices Co., Aurora, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum
To Exhaust Incandescent Lamps.
Arrow Machine Co., 527 Hackensack Plank Rd., Union City, N. J.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel
Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel
(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1826 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS
This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Products Co., 23 Elkins (S. B.), Boston, Mass.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4261 Belmont Ave., Chicago.
All-Henry Coil Co., South Gale, Cal.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Amsco Products, Inc., 416 Broome, New York. (TRF Kit.)
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Auburn Button Works, Auburn, N. Y.
Audioformer Transformer. See Pacent Electric Co.
Audiohm. See Electrad, Inc.
Autoformer. See Thordarson Elec. Mfg. Co.
Avalcon. See Pacent Electric Co.
B-Conomizer. See Pilot Elec. Mfg. Co.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Birnbach Radio Co., 254 W. 31st, New York, N. Y.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Bremer-Tully Mfg. Co., 520 S. Canal, Chicago, Ill.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Bruno-Radio Corp., 40 Payntar Ave., Long Island City, N. Y.
Buffer. See Aerovox Wireless Corp.
Buffalo. See Amsco Products, Inc.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacitgrad. See Pilot Elec. Mfg. Co.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Central Radio Corp., Beloit, Wis.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.
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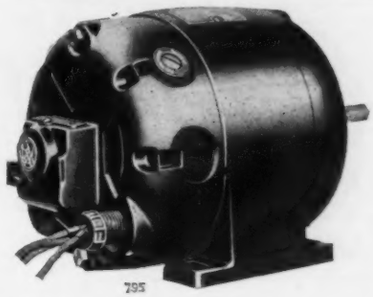

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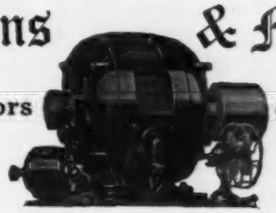
Motors  *and Fans*

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Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Concertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Counterphase Kit. See Bremer-Tully Mfg. Co.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crefot. See Premier Elec. Co.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
Davohm. See Daven Corp.
DeForest Radio Co., Jersey City, N. J.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 4377 Bronx Blvd., New York.
Duopack. See Pacent Elec. Co.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc. (Div. of P. R. Mallory & Co.), Portchester, N. Y
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
Euphonic. See Bremer-Tully Mfg. Co.
Excelsior Radio Corp., 220 Grand, Brooklyn, N. Y.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., Crawford & Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See Amsco Products, Inc.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 135 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 900 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
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Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hammarlund-Roberts, 1182 Broadway, New York. (Kit.)
Harmonik. See Karas Elec. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. (TRF Kits.)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Hi-Q Kit. See Hammarlund.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co. 2¼ S. 20th, Philadelphia, Pa.
Isodon. See Auburn Button Works.
Isograd, Isoleak. See Pilot Elec. Mfg. Co.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Karas Elec. Co., 4046 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kilograd. See Pilot Elec. Mfg. Co.
Kroblack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 82 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireless Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Leakandenser. See Daven Corp.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
Megzit. See Cole Mfg. Corp.
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Metralign. See General Instrument Corp.
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Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
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Microstat. See Premier Elec. Co.
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Modern Electric Mfg. Co., Toledo, O.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 76th St. and Greenwood Ave., Chicago, Ill. (Amplifier Kits.)
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Orthometric. See Karas Elec. Co.
Orthophone. See Amsco Products, Inc.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol. See Wireless Radio Corp.
Paragon Elec. Corp., 200 Varick, New York, N. Y.
Perry Wire Works, 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Plander. See Amsco Products, Inc.
Pierce Airo. See United Scientific Laboratories.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Elec. Mfg. Co.
Potter Mfg. Co., Waukegan, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
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Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Receptor Co.
Recto Mfg. Co., 23 W. Third, Cincinnati, O.
Reesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Elec. Mfg. Co.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Sangamo Elec. Companies, Springfield, Ill.
Scanlan Elec. Mfg. Co., 1113 N. Franklin, Chicago, Ill. (Output Transformers.)
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 397 Phillips, Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Sonatron Tube Co., Chicago, Ill. (Resistance Coupled Amplifier).
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Tandem. See Bremer-Tully Mfg. Co.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Thorola. See Reichman Co.
Tobe Deutschman Co., Cambridge, Mass.
Tone Control. See Sprague Specialties Co.
Toroid. See All American Mohawk Corp.
Torostyle. See Bremer-Tully Mfg. Co.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tune Rite. See Radiall Co.
Turn-It Radio Sales, 71 Murray, New York, N. Y.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Tyrman Elec. Corp. 143 W. Austin Ave., Chicago, Ill.
Ultimax. See Pacent Elec. Co.
Ultra Vario. See Bruno Radio Corp.
Univernier Condenser. See Auburn Button Works.
Universal Winding Co., Boston, Mass.
Variall Condenser. See Muter Co.
Verni-Juster. See Brooklyn Metal Stamping Corp.
Waterbury Button Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.

RADIO HARDWARE. See Radio Mountings.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels, etc.

Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Radio Hardware Co., 135 Grand, New York.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Bonza. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Eureka. See Morse Co., Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th and Greenwood Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Paragon Elec. Corp., 200 Varick, New York, N. Y.
Saturn Mfg. & Sales Co., 48 Beekman, New York, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acast. See United Radio Corp.
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 623 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Bruno Radio Corp., 40 Payntar Ave., Long Island City.
Cabelug. See Jones, Howard B.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Also Socket Adapters.)
Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
Centralab. See Central Radio Laboratories.
Clarostat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
De Veau. See Stanley & Patterson.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See Amsco Products Co.
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heinemann Elec. Co., Philadelphia, Pa.
Imp. See Carter Radio Co.
Jones, Howard B., 2226 Wabansia, Chicago, (Multiple Plug.)
Klosner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago.
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Radiall Co., 50 Franklin, New York, N. Y.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio.
Royalty. See Electrad, Inc.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tubestat. See Muter Co.
Union Radio Corp., 124 Sussex Ave., Newark, N. J.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Elec. & Mfg. Co., 351 Halsey, Newark, N. J.
Cable Supply Co., 31 Union Square, New York, N. Y.
Ceco Mfg. Co., 702 Eddy, Providence, R. I.
Cleartron Vacuum Tube Co., 28 W. 44th, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
Daven Corp., 158 Summit Ave., Newark, N. J.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Gold Seal Electrical Co., 250 Park Ave., New York, N. Y.
Manhattan Elecl. Supply Co., 17 Park Pl., New York, N. Y.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Perryman Electric Co., 33 W. 60th, New York, N. Y.
Radio Corp. of America, 233 Broadway, New York.
Raytheon Mfg. Co., Kendall Square Bldg., Cambridge, Mass.
Schickerling Products Corp., 401 Mulberry, Newark, N. J.
Sonatron Tube Co., 108 W. Lake, Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 533 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.
Van Horne Co., 280 Center, Franklin, Ohio.

RADIO TRANSFORMERS. See Radio Circuit Components.
RADIO TUBE BASES. See Radio Molded Parts.
RADIO TUBE BULBS (Unfinished). See Bulbs, Glass.

RADIO WIRING HARNESS

Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

Afco. See American Fabric Co.
Alden Mfg. Co., Brockton, Mass. (Adapters.)
Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
Arcturus Radio Co., 255 Sherman Ave., Newark, N. J. (Adapters.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Adapters.)
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa (Adapters).
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind. (Adapters.)
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Morse Co., Frank W., Boston, Mass.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Riga. See Birnbach Radio Co.

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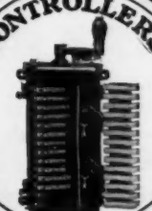

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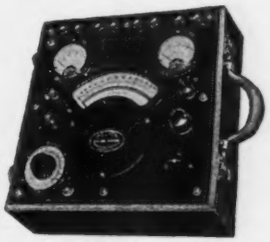

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Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N. Y.

RADIUM POWDER AND PAINT

Radium Dial Co., 3332 Forbes, Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.
RAWHIDE GEARS. See Gears & Pinions, Rawhide.
READING LAMP BASES. See Bases, Reading Lamp.
REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

KEY

Battery Charging ..... See B
Floor Boxes ..... See F
Welding ..... See W
Machine Tool ..... See W
Watertight, Marine, Mine ..... See M
Car Trailer Connection ..... See C
Extension ..... See E

A. B. C. See Anderson Mfg. Co.						
Adam Electric Co., Frank, St. Louis, Mo.	F					
Adapti Co., 2996 E. 72nd, Cleveland, O.	F					
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.		B	W	M	C	E
Appleton Elec. Co., 1763 Wellington Ave., Chicago, Ill.				M		
Arktite. See Crouse-Hinds Co.						
Arnessen Electric Co., 13 Water, New York				M		
Arrow Elec. Co., Hartford, Conn.	F	B	W			
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y.						E
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.	F		W	M		
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.)			W			
Campbell. See Steel City Elec. Co.						
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal.	F					
C. E. M. Co. See Conn. Elec. Mfg. Co.						
C. H. See Cutler-Hammer Mfg. Co.						
Circle F Mfg. Co., Trenton, N. J.				M		
Conduletto. See Crouse-Hinds Co.						
Connecticut Elec. Mfg. Co., Bridgeport, Conn.	F					
Cory & Son, Chas., 183 Varick, New York				M		
Crouse-Hinds Co., Syracuse, N. Y.		B	W			
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.	F					
Delta-Star Elec. Co., 2433 Fulton, Chicago			W	M		
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.		B				
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.					C	
Elwell Parker Elec. Co., 4222 St. Clair Ave., N. E., Cleveland, O.		B				
Fielding. See Stanley & Patterson.						
Fountain's. See Jenkins Mfg. Co.						
Fullman Mfg. Co., Latrobe, Pa.	F					
Fullman. See Steel City Elec. Co.						
Gleason & Co., J. L., 241 Franklin, Boston, Mass.						E
General Elec. Co., Bridgeport, Conn.		B				
H. & H. See Hart & Hegeman Mfg. Co.						
Hart & Hegeman Mfg. Co., Hartford, Conn.		B	W			
Hessel Co., W. F., 76 Greenwich, New York, N. Y.			W	M		E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.)		B	W			
Indestructible. See Kliegl Bros. Universal.						
Jenkins Mfg. Co., Bloomfield, N. J.						E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y.	F	B	W	M		
Latrobe. See Fullman Mfg. Co.						
Major Equipment Co., 4603 Fullerton ave., Chicago, Ill.				M		
Loeffelholz & Co., Milwaukee, Wis.					C	
NePage McKenny Co., Armour Bldg., Seattle, Wash.	F					
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa.					C	
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio			W			
Ostrander Elect. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.						
Preset. See Walker Bros. Co.						
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.			W	M	C	E
Quadrangle Mfg. Co., 30 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)						
Ralco Mfg. Co., 123 N. Albany Ave., Chicago, Ill.						
Russell & Stoll Co., 53 Rose, New York	F	B	W	M		E
Square D. Co., Detroit, Mich.			W			
Stanley & Patterson, 150 Varick, New York, N. Y.	F					
Steel City Elec. Co., Pittsburgh, Pa.	F					E
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.				M		
Walker Bros., 1417 Sansom, Philadelphia	F					E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	F	B	W	M		
Yale. See Electric Products Co.						

RECORDERS, Elapsed Time. See Indicators, Operation.
REDUCERS, Socket. See Socket Reducers.
REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

ABolite Reflector Co., 7500 Sherman Ave., Cleveland, O.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Cello, Inc., 96 Prince, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Marbelite Products Co., 140 N. Robey, Chicago, Ill.
Maxolite. See Ralco Mfg. Co.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 30 S. Peoria, Chicago Ill.
Ralco Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.

REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
Allen Filter Co., 25 S. St. Clair, Toledo, O. (Water Cooler Unit.)
American Refrigerator Corp., Peru, Ind.
Argus Products Co., 174 E. Water, Portland, Ore.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Automatic. See Illinois Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectrICE Corp., Belding, Mich.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Boyer Refrigerator Co., 2217 Locust, St. Louis, Mo.
Cameo Refrigerator Corp., 973 N. Main, Los Angeles, Cal.
Castle Double-Servis. See Home Products Corp.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 131 E. 34th, New York, N. Y.
Cold Storage Refrigerator Co., Eau Claire, Wis.
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dillingham Mfg. Co., Sheboygan, Wis.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gruendler Mfg. Co., Gustav J., 814 N. Broadway, St. Louis.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill. (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Co., Euclid Ave. at 65th, Cleveland, O.
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Home Products Corp., Jackson, Mich.
Howe Scale Co., Rutland, Vt.
Iceless Cooler Corp., 225 N. Michigan Ave., Chicago, Ill. (Ice Cream Cabinets.)
Illinois Refrigerator Co., Morrison, Ill.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Fourth & Greenhill Ave., Wilmington, Del.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Electric Refrigeration Corp., Grand Rapids, Mich.
Ligonier Refrigerator Co., Ligonier, Ind.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Louisville Refrigerator Co., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2864 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Northey Mfg. Co., Waterloo, Iowa.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha.
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Ranney Refrigerator Co., Greenville, Mich.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Revolvo. See Iceless Cooler Corp.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Sacn-Lowell Shops, Newton Upper Falls, Mass.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal.
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

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RELAYS

(See also Circuit Breakers and Thermostats.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Dunco. See Dunn, J. Struthers.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Wilcolator Co., 17 Nevada, Newark, N. J.

REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE

Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS

Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ward-Leonard Electric Co., Mount Vernon, N. Y.

RESISTORS. See Units, Rods & Grids.
REVOLUTION COUNTERS. See Tachometers.
RHEOSTATS,
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

KEY

Battery Charging ..... See B
Stage Dimming ..... See D
Meter Testing (Laboratory) ..... See L
Plating Tank ..... See P
Motion Pictures (Projector Lamp) ..... See M
Motor Starting, Field and Speed Regulating. See F

	F	B	D	P	M	L
Allen-Bradley Co., 493 Clinton, Milwaukee						L
Biddle, James G., 1211 Arch, Philadelphia						L
Boice, W. B. & J. E., 1730 Norwood Ave., Toledo, O.						L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.)		B				
Bradleystat. See Allen-Bradley Co.						
Controlite. See Ward Leonard Elec. Co.						
Crown Rheostat & Supply Co., 1910 Park Ave., West Chicago, Ill.				P		
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.	F	B	D			L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa.	F					
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.	F					
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.		B				
General Electric Co., Schenectady, N. Y.	F					L
Holzmuller, C. J., 1108 Howard, San Francisco, Cal.			D			
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y.			D		M	
Knoeller Elec. Co., De Pere, Wis.	F					
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago	F	B	D		M	L
Robertson, Leo F., 536 W. 22nd, New York, N. Y.					M	
Schaefer Bros. Co., 1059 W. 11th, Chicago		B				
Simplicity. See Cutler-Hammer Mfg. Co.						
Union Elec. Mfg. Co., Milwaukee, Wis.	F					
Universal. See Ward Leonard Elec. Co.						
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.		B				
Vitrohm. See Ward Leonard Elec. Co.						
Ward Leonard Elec. Co., Mt. Vernon, N. Y.	F		D		M	
Watton. See Electric Products Co.						
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	F				M	

RINGS Seal. See Packing.

RIVETS

Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Merwin Mfg. Co., Bridgeport, Conn. (Solid & Tubular).
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

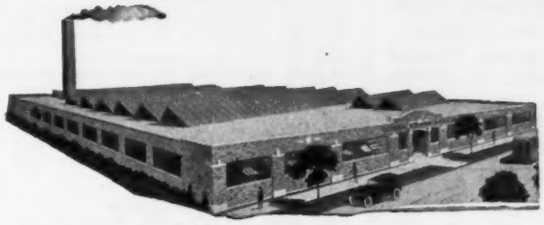
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Murhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.

Name Plates



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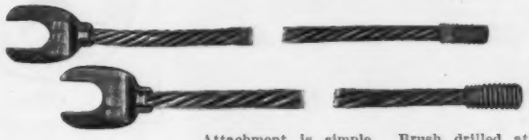

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Four points of superiority:

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Standard length is 5 inches; other lengths can be furnished if so specified.

Write for interesting catalog.

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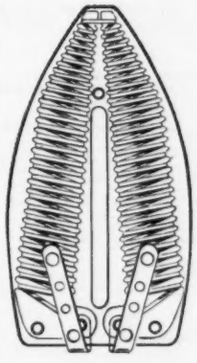

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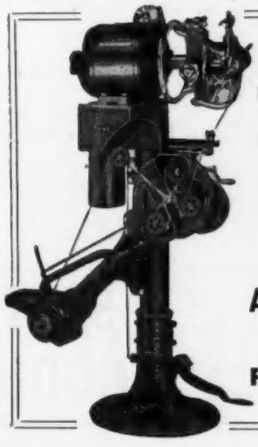

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Panelyte Co., Enterprise Ave., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS
Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Republic Rubber Co., Youngstown, O.

RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge
Toycraft Rubber Co., Ashland, O.

RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines.

SCRAPERS, Wire
Acme. See A. Laubscher.
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW MACHINE PRODUCTS
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Ceioron Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis,
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Steinen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corn., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive
Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)
American Screw Co., Providence, R. I.

SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery
Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Ferry Mfg. Co., St. Louis, Mo.
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES
Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.

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Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

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Acme Lamp Shade Co., 555 W. Madison, Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Artistic Lamp Shade Co., 848 Milwaukee Ave., Chicago.
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatchford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chintz.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Keiton Mfg. Co., Worcester, Mass. (Silk.)
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Franklin Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Storrs Mica Co., 11 Park Place, New York, N. Y.
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tapestrelle Corp., 44 E. 29th, New York, N. Y.
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

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Bayley & Sons, 105 Vandervoort, Brooklyn, N. Y.
Bent Glass Novelty Co., 54 W. Third, New York, N. Y.
Handel Co., Meriden, Conn.
Mosaic Shade Co., 589 E. Illinois, Chicago, Ill.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Novelty Lighting Corp., 2488 E. 22nd, Cleveland, O.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic
Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durez. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 230 10th Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oameo. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica
Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

SHEARS, Insulation
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket
Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)
Waterbury Mfg. Co., Waterbury, Conn.

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA
Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire
Baker & Co., Inc., 54 Austin, Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE
For Switchboard Slabs and Barriers.
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Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Munson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

SLEEVE-BEARINGS. See Bearings and Bushings.
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator
(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3240 E. Monroe, Toledo, O.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

SNAP SWITCHES. See Switches, Snap

SOAPSTONE
For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Lin-Stun. See Westinghouse.
Soapstone Products Co., 97 Warren, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SOCKET LININGS. See Linings, Socket
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain and Attachments
Pull Chain, Chain Links, Chain Adjusters, Acorns, Extensions, Insulation Chain Splicers.
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Arrow Electric Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Harrigan, T. M., Woodstock, Vt. (Links.)
Hart & Hegeman Mfg. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

SOCKET REDUCERS
Arrow Elec. Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Can-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Schenectady, N. Y.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 80 Boylston, Boston, Mass.

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SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key ..... See K
Composition ..... See W
Metal Shell ..... See B
Porcelain ..... See A
Pull Chain ..... See P
Push Through ..... See T

Sign Receptacles ..... See A

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Alabax. See Arrow Elec. Co.
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Co., Hartford, Conn. ..... M C K T P B A
Arrogrip. See Arrow Elec. Co.
Atlantic Elec. Lamp Co., Salem, Mass. ..... K .. P ...
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C .... P B .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M .. K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M .. K T .. B A
Crouse-Hinds Co., Syracuse, N. Y. ..... A W .....
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T .. B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B ..
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C .....
Federal Electric Co., 6700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 230 10th Ave., New York, N. Y. ..... M C ..... B ..
Gaynor Elec. Co., Bridgeport, Conn. ..... A
General Elec. Co., Bridgeport, Conn. ..... M C K T P B A
Glow Elec. Co., 22 Queens, Long Island City, N. Y. ..... M ..... B ..
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... M C K T P B A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K .. P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Meteor Elec. Corp., 499 E. 70th, New York, N. Y. ..... K .. P ...
Molded Socket Corp., Railroad, Pa. ..... K .....
Multi Elec'l Mfg. Co., 210 N. Ogden Ave., Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Ratner Elec. Mfg. Co., 195 Morgan Ave., Brooklyn, N. Y. ..... M ..... P B ..
Roberts Elec. Mfg. Co., 211 Centre, New York, N. Y. (Candle.) ..... T .. B ..
Rodale Mfg. Co., 200 Hudson, New York, N. Y. .....
Royal. See Sears, Henry D.
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 80 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
TEC. See Electric Company.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A
Union Insul. Co., Parkersburg, W. Va. .....
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. ..... P .. B .. W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. ..... A
Walco. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. .....
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B ..
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P ....
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Cambridge Smelting Co., Cambridge, Mass.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester. See Chicago Solder Co.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SOLENOIDS. See Coils, Finished.

SOLDERING

Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS

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Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Amco. See American Solder & Flux Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Blue Seal Chemical Co., 126 Locust, Roselle, N. J.
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brubner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductalutc. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Fluxite. See Monarch Products Co.
General Elec. Co., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Letellier Laboratories, 119 Main St. E., Rochester, N. Y.
Leveridge, Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neer Co., L. F., Butler, O. (Flux and Solution.)
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammoniea.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., Jersey City, N. J.
Redens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 380 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Silva-Wares, Inc., 134 W. 26th, New York, N. Y.
Snowflake. See Grasselli Chemical Co.
Snowflux. See Highland Electro Chemical Co.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co.
Superior. See Highland Electro Chemical Co.
Technical Products Co., 116 S. Sheridan Sq., Pittsburgh, Pa. (Paste).
Tinol. See American Solder & Flux Co.
Tisit. See Letellier Laboratories.
Universal Laboratories, University, Va. (Flux.)
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex R.
Yankee. See Leveridge, Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept R, 1217 Washington, Boston.
Adroit. See Adrola Corp.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
American Elecl. Heater Co., Detroit, Mich.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., Ravenna, Ohio.
Betsy Ross. See Central Flatiron Mfg. Co.
Bode. See Baco Electric Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 712 Ontario Ave., N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., 124 W. 18th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper.)
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lucifer. See Jones Point Tool & Elec. Co.
McAdams Co., J. C., Long Island City, N. Y.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., First National Bank Bldg., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Nu-Way. See McAdams Co.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio. See Drake Elec. Wks.
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Soderwand. See Suttle Equipment Co.
Superior Elec. Products Co., 1300 S. 13th, St. Louis, Mo.
Suttle Equipment Co., Lawrenceville, Ill.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N. Lawrence, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec. Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator

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Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.

SOLENOIDS. See Coils
SOLVENTS & REDUCERS, VARNISH. See Paint, Varnish, Lacquer.
SPAGHETTI. See Tubing, Varnished Fabric.
SPEED CHANGING UNITS. See Gears (Speed Changing Units).
SPEED INDICATORS. See Tachometers.
SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYING OUTFITS

Airway. See Binks Spray Equip. Co.
Balco. See Simons Paint Spray Brush Co.
Binks Spray Equipment Co., 3120 Carroll Ave., Chicago, Ill.
De Vilbiss Mfg. Co., 3750 Detroit Ave., Toledo, Ohio.
Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Eureka Pneumatic Spray Co., 87 130th, Richmond Hill, N.Y.
Ideal Air Brush Mfg. Co., 203 Lafayette, New York, N. Y.
Little Brown Jug, Inc., Reading, Pa.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago,
Macleod Co., 2232 Bogen, Cincinnati, O.
Paasche Air Brush Co., 1911 Diversey Parkway, Chicago, Ill.
Presto. See Metal Specialties Mfg. Co.
Simons Paint Spray Brush Co., 1017 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill.
Sprayit. See Electric Sprayit Co.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES

Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS,

Advance Spring & Wire Co., 1749 Carroll Ave., Chicago,
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Farrington & Co., 28 W. Grand, Mt. Vernon, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Landsdale, Pa.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Wallace Barnes Co., Bristol, Conn.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.
STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

Heavy Stamping and Drawing.

Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.

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New York Office:—331 Madison Avenue

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Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
Arrow Automatic Products Corp., 27 Vestry, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. O., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Kelly Brass Wks., 226 W. Ontario, Chicago, Ill.
Kickhaefer Mfg. Co., 859 Reade, Milwaukee, Wis.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Niagara Metal Stamping Corp., Niagara Falls, N. Y.
Paton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Reliance Die & Stamping Co., 501 N. La Salle, Chicago.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 6 Howard, New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

STEATITE. See Cores, Resistance Coil.

STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances

Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet

Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelee. See Mansfield Sheet & Tin Plate Co.
Central Alloy Steel Corp., Massillon, O.
Dynelec. See Mansfield Sheet & Tin Plate Co.
Empire Steel Corp., Mansfield, O.
Manelec. See Mansfield Sheet & Tin Plate Co.
Mansfield Sheet & Tin Plate Co., Mansfield, Ohio.
Metelec. See Mansfield Sheet & Tin Plate Co.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Mansfield Sheet & Tin Plate Co.
Tranelec. See Mansfield Sheet & Tin Plate Co.
Trumbull Steel Co., Warren, Ohio.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers

Hall-Will, Inc., Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separaters.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL

Acme Steel Co., 2840 Archer Ave., Chicago, Ill.

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.

Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife

Cut-Out Switches.
Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Couch Co., S. H., Norfolk Downs, Mass.
Crown. See Edwards & Co., Inc.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hart Mfg. Co. Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Puritan. See S. H. Couch & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Con-Tac-Tor. See Absolute Con-Tac-Tor Corp.
Cooper Hewitt Electric Co., 410 Eighth, Hoboken, N. J.
Cramblett Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Hywatt. See Cramblett Engr. Co.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
M. D. Co. See Mechanical Devices Co.
Mechanical Devices Co., Aurora, Ill.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
Diamond C. See Standard Elec. Supply Co.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 3 Ave. L., Newark, N. J.
Hill. See Mendell Mfg. Co.
Large-Dail Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen, John W., 201 N. Los Angeles, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Mendell Elec. Mfg. Co., Mattapolsett, Mass.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Safuse. See Federal Steel Products Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.

Standard Elec. Supply Co., 223 N. 13, Philadelphia, Pa.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versai. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co., 144 Bleeker, Newark.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegmann & Co., E. M., 3611 N. 11th, St. Louis.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectowitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. B., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

KEY

Feed Through	See p
Fixture (Canopy, Candelabra and Key Arm)	See F
Flush	See f
Lever, Toggle, Tumbler	See L
Pendant	See p
Push Button	See P
Rotary	See R
Surface	See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo.	f						
Anylite Elec. Co., Ft. Wayne, Ind.						L	
Arrow Electric Company, Hartford, Conn.	f	s	p	P	R	L	F
Arrow Head. See Arrow Elec. Co.							
Beaver Mfg. Co., 625 N. Third, Newark, N. J.	f		p	P			F
Best. See United States Elec. Mfg. Corp.							
Brascolite. See Guth & Co., Edwin.							
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa.	f						
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.						L	F
Bryant Elec. Co., Bridgeport, Conn.	f	s	p	P	R	L	F
B. S. Co. See Bridgeport Switch Co.							
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.							F
Circle F. Mfg. Co., Trenton, N. J.	f			P		L	F
Circle T. See Trumbull Elec. Mfg. Co.							
Connecticut Elec. Mfg. Co., Bridgeport, Conn.			p	P	R	L	F
Crouse-Hinds Co., Syracuse, N. Y.						L	
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.				P		L	
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.						R	
Diamond H. See Hart Mfg. Co.							
Dugle. See Bryant Elec. Co.							
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill.							F
Gaynor Elec. Co., Bridgeport, Conn.	f					L	
General Elec. Co., Bridgeport, Conn.	f	s	p	P	R	L	F
Glo-Guide. See Bryant Elec. Co.							
Gold Star Push Switch. See Hart & Hegeman.							
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo.							F
Hart Mfg. Co., Hartford, Conn.	f	s	p	P	R	L	
Hart & Hegeman Mfg. Co., Hartford, Conn. (Door Bolt Control.)	f	s	p	P	R	L	F
Hart. See Hart & Hegeman Mfg. Co.							
H. & H. See Hart & Hegeman Mfg. Co.							
Hubbell, Harvey, Inc., Bridgeport, Conn.		s	p			L	F
Jost. See Morse, Frank W.							
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.	f			P			
Leviton Mfg. Co., 226 Newell, Brooklyn							F
Levolier. See McGill Mfg. Co.							
McGill Mfg. Co., Valparaiso, Ind.	f					L	F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y.						L	F
Metropolitan Elec. Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.		s			R		
Morse Co., Frank W., 291 Congress, Boston, Mass.				P			
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago, Ill.						L	F
National. See Standard Elec. Mfg. Co.							
New England. See Paulding, John L.							
Nutmeg. See Hubbell, Harvey, Inc.							
Operite. See Morse Co., Frank W.							
Pass & Seymour, Solvay Sta., Syracuse, N. Y.	f	s	p	P		L	F
Paulding, John I. New Bedford, Mass.	f	s		P			
Pen Tap. See Beaver Mfg. Co.							
Perkins. See Bryant Elec. Co.							
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y.						L	
Pilotoggle. See Pilot Elec. Mfg. Co.							
Pullrite. See Morse, Frank W.							
Roberts Elec. Mfg. Co., 2 Centre, New York, N. Y.							F
Rodale Mfg. Co., 200 Hudson, New York	p						
Sears, Henry D., 80 Boylston, Boston	f	s	p	P	R	L	F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.				P			
Snapit. See Marks Products Co.							
Spartan. See Bryant Elec. Co.							
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill.	f	s		P	R	L	
Triple. See Bryant Elec. Co.							
Trumbull Elec. Mfg. Co., Plainville, Conn.	f	s		P	R	L	
Twi-Lite. See McGill Mfg. Co.							

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Switches, Snap—Continued
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y. ..... F
Victor. See Keil & Son, Francis.
Weber. See Sears, Henry D.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y. ..... F
Workrite. See Morse, Frank W.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Penn Electric Machine Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.
Sechrist Mfg. Co., Albert, 1717 Logan, Denver, Colo.

SWITCHES, Tank

Anderson Electrical Works, 212 W. Austin Ave., Chicago, Ill.
Automatic Appliance Co., 226 N. St. Clair, Dayton, Ohio.
Automatic Switch Co., 154 Grand, New York.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Penn Elec. Switch Co., 306 Twelfth, Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilboken Mfg. Co., 404 Grove, Milwaukee, Wis.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Cleveland. See D. J. Time Switch Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
D-J Time Switch Co., 1306 E. 14th, Cleveland, O.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Milnerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Thompson Clock Co., H. C., Bristol, Conn.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenten Ave., Philadelphia, Pa.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Vesder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elecel. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brocklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Niagara Metal Stamping Corp., Niagara, N. Y.
Premax. See Niagara Metal Stamping Corp.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville, Inc., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;

Tape, Sleeving, Webbing.
Anchor Webbing Co., Nye, Pawtucket, R. I. (Cotton, Silk.)
Awebco. See Anchor Webbing Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentape. See Belden Mfg. Co.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.

Hall & Carey Weaving & Belting Co., Lockport, N. Y.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Armature-White. See Boston Woven Hose & Rubber Co.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., P. O. Box 5077, Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okenite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Evergrip. See Boston Woven Hose & Rubber Co.
Firestone Tire & Rubber Co., Akron, O.
General Elec. Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holdfast Rubber Co., Atlanta, Ga.
Holditite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville, Inc., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Magnet. See Boston Woven Hose & Rubber Co.
Manson. See Okonite Co.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relic. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co
Security. See United States Rubber Co.
Service. See Boston Woven Hose & Rubber Co.
Slipknot. See Plymouth Rubber Co.
St. Louis Rubber Cement Co., 3952 West Pine, St. Louis.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stitwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holdfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridion Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

TAPS. See Stocks, Dies and Reamers.
TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

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TERMINALS AND CONNECTORS

Low Tension, Secondary Terminals and Connectors.
All-in-One. See Ohio Parts Co.
Barcy-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., Dept. ER4, 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Fleron & Son, M. M., 113 N. Broad, Trenton, N. J.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
K. E. M. See Kulier Elec. Mfg. Co.
Kulier Elec. Mfg. Co., 575 Pierce Ave., Long Island City.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3391 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. D., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury, Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Mfg. Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Company, 493 Clinton, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., G Dept., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ex-Ki-Tester. See Weidenhoff, Joseph.
Forest Electric Co., 273 New, Newark, N. J.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 477 Broadway, New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kletzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Meco. See Metropolitan Mfg. & Elec. Co.
Metropolitan Mfg. & Elec. Co., 1163 Sedgwick, Chicago, Ill.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Forest Electric Co.
Portometer. See Forest Electric Co.
Portostat. See Forest Electric Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES

Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Stupakoff Laboratories, 6617 Hamilton Ave., Pittsburgh, Pa.

THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL

Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

THERMOSTATS

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Thermostat Co., 226 Jeliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 2 Lanesville Ave., Boston, Mass.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.

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Thermostats—Continued
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Leachwood Co., Janesville, Wis.
Manhattan Elec'l Supply Co., New York, N. Y.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Sensatherm. See Mercoid Corp.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teeple Co., L. R., 540 E. 9th, Portland, Ore.
Thermomap. See Spencer Thermostat Co.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.

TIGHTENERS, Commutator
Elmes Engineering Works, Chas. F., 222 N. Morgan, Chicago, Ill.

TIME SWITCHES. See Switches, Time.

TINNING TANKS, WIRE. See Wire Manufacturing Machines.

TINSEL. See Wire, Insulated.

TIPS, Cord
Alden Mfg. Co., Brockton, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentube. See Belden Mfg. Co.
Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
Na-Ald. See Alden Mfg. Co.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S., 415 Saunton, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Commutator Truing
Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery
Battery Equipment & Supply Co., 1638 S. Wabash Ave. Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cowie Elec. Co., 1823 Wyandotte, Kansas City, Mo. (Jar Lifting Pliers.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Ibsco. See Illinois Battery Steamer Co.
Illinois Battery Steamer Co., Peoria, Ill.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES
Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Champion. See Lenk Mfg. Co.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Red Dragon. See Lenk Mfg. Co.
Staysallite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.

TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS
Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Oil Burner.

TRANSFORMERS, Low and Intermediate Voltage
Sorgel Elec. Co., 89 W. Water, Milwaukee, Wis.

TRANSFORMERS, Oil Burner Ignition
For Oil Burners and Gas Tube Signs.
American Bosch Magneto Corp., Springfield, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elect. Supply Co., 17 Park Pl., New York, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power
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Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.

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432 Danforth Ave., Jersey City, N. J.

TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel
Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.

TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Paper Tube Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
British American Tube Co., 233 Broadway, New York.
Bull Dog. See British American Tube Co.
Chase Companies, Inc., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1595 Coltman Rd., Cleveland, O.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Metal Hose & Mfg. Co., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Leachwood Co., Janesville, Wis.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber
Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric
Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.

TWINE, Armature Winding; Torpedo Cord
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.

UNITS, Rods and Grids, Resistance
Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.

Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Chromalax. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Darie Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Farrington & Co., Inc., 28 W. Grand, Mt. Vernon, N. Y.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Witlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elect. Co., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hexwound. See Monitor Controller Co.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa. (Radio Resistance.)
Kriscker's Mfg. Co., 255 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
National Elec'l Supply Co., 1328 New York Ave., Washington, D. C.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Sepco. See Automatic Electric Heater Co.
Simplex Electric Heating Co., 85 Sidney, Cambridge, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waag. Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 422 1st Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.

VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner

VACUUM DRYING & IMPREGNATING OVENS. See Ovens, Industrial.

VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated
Absolute Con-tac-tor Corp., Elkhart, Ind.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., ft. of Tolman, Boston, Mass. (Water.)
Crane Co., S. Michigan Ave., Chicago, Ill.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 875 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Jenkins. See Automatic Switch Co.
Liberty Electric Corp., Stamford, Conn.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Ziach Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Victor. See Lunkenheimer Co.
Ziach Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)

VARNISH. See Paint, Varnish, Lacquer.

VARNISHED TAPE. See Tape, Varnished Fabric.

VARNISHED TUBING. See Tubing, Varnished Fabric.

VOLT BOXES. See Instruments, Laboratory Standard.

VOLTMETERS. See Instruments.

VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works, Akron, Ohio.

WASHERS, FIBRE. See Fibre.

WASHERS, Leather
Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

Heating Unit Service
Manufacturers—Designers
INDUSTRIAL HEATER COMPANY
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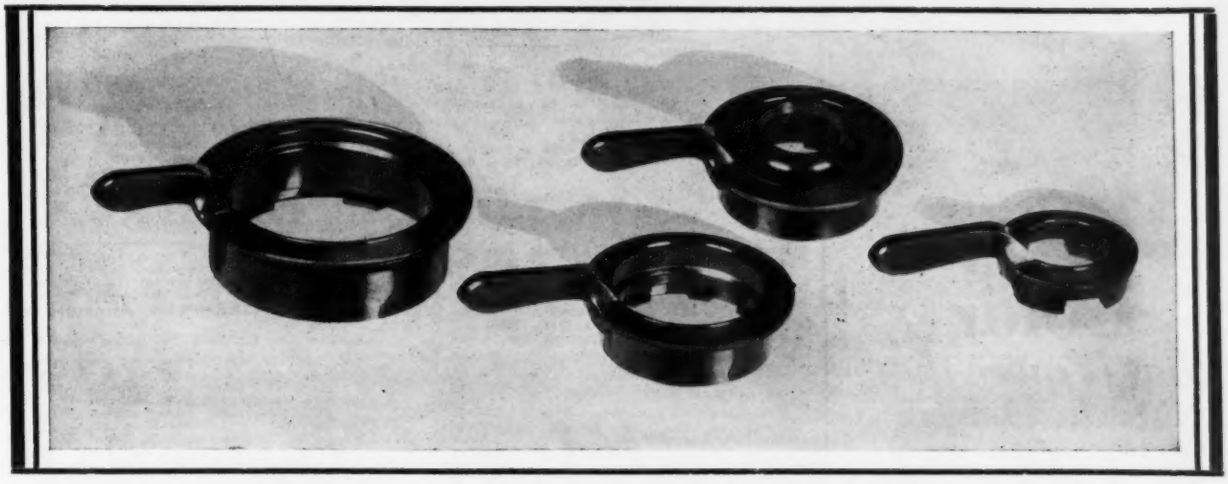

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CONNECTICUT
MOLDED PRODUCTS CORPORATION
MERIDEN, CONN.

WASHERS, Lock
Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
National Lock Washer Co., Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.

WASHERS, Metallic
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.

WATTMETERS. See Instruments.

WAX AND COMPOUNDS
Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago..... S ..
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Black Nego. See Williams Co., F. M.
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S ..
Clifton Mfg. Co., 65 Brookside Ave., Boston..... C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... W S ..
Dielectric Mfg. Co., St. Louis, Mo. ..... W .. C
Dolph Co., John C., 168 Emmet, Newark, N. J. W .. ..
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Bridgeport, Conn. ..... W .. ..
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O. ..... W S ..
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich. ..... W .. ..
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York. ..... W .. ..
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. ..... W .. ..
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W .. ..
Nu-Blac. See Star Porcelain Co.
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. ..... W .. ..
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. ..... W .. ..
Sherwin-Williams Co., Cleveland, O. ..... W .. C
Standard Varnish Wks., 433 4th Av., New York.. W .. ..
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. ..... W S ..
Star Porcelain Co., Trenton, N. J. ..... W .. C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 376 Johnson Ave., Brooklyn, N. Y. ..... W S ..
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. ..... S ..
Williams Co., F. M., 1288 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y. ..... W .. ..

WELDS, Lamp Lead-in. See Filaments, Incandescent

WELDING AND CUTTING OUTFITS
Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme. See Cushing Mfg. Co.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Corp., 726 Washington, Buffalo.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Atlas. See Railway Track Work Co.
Automatic Trolley Guard Co., 65 Carroll, Buffalo, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Ry. Improvement Co., 2070 E. 61st, Cleveland, O.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Erico. See Electric Railway Improvement.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fusion Welding Corp., 103rd St. & Torrence Ave., Chicago.
Fuzon. See Fusion Welding Corp.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y.
Gesco. See General Engineering.
Gibb Welding Machines Co., Bay City, Mich.
Hansen. See Northwestern Mfg. Co.
Indianapolis Switch & Frog Co., Springfield, O.
Lincoln Electric Co., Colt Bd. and Kirby Ave., Cleveland.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Plastic Arc. See Wilson Welder & Metal Co.
Railway Track Work Co., 3132 E. Thompson, Philadelphia.
Rail Welding & Bonding Co., 1615 Collamer Ave., Cleveland.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wentzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., Fort & Mt. Elliott, Detroit, Mich.
Taylor-Winfield Corp., 12 Atlantic, Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Thordarson Electric Mfg. Co., 500 W. Huron, Chicago, Ill.
Toledo. See Thompson.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Welding Materials Co., 114 Liberty, New York, N. Y.
Weldrite. See Electric Welding Machine Co.
Wemco. See Welding Materials Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Winfield Elec. Welding Machine Co., 12 Atlantic, Warren, O.
Zeus. See Gibb Welding Machine Co.

WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WINDERS
Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.

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Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.
Winding Forms. See Forms, Coil Winding.

WINDING FORMS. See Forms, Coil Winding.

WINDING MACHINES, Armature and Field Coil
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electrical Products Mfg. Co., Providence, R. I.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 312 Centre, New York.
Ridlon Company, Frank, 253 A St., Boston, Mass.
Universal Winding Co., Boston, Mass.
Varley Duplex Magnet Co., 136 Seventh, Jersey City, N. J.
Weber & Scher Mfg. Co., 263 Sussex Ave., Newark, N. J.
Weehawken Elec. & Mfg. Co., 543 Gregory Ave., Weehawken, N. J.

WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory
Athey Co., 6172 West 65th St., Chicago, Ill.

WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Scrapers, Wire.
Strippers. See Scrapers, Wire;
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare
Armature Banding .....See S
Copper Wire .....See C
Iron Wire .....See S
Phosphor Bronze .....See B
Radio Bus Wire .....See C
Resistance Wire .....See R
Steel Wire .....See S
Acme Wire Co., New Haven, Conn. ..... C ....
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa. ..... C B ..
American Brass Co., 25 Broadway, New York.
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C B ..
American Electrical Works (Phillipsdale), Providence, R. I. ..... C ....
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C .. S
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... C .. S
Anaconda. See American Brass Co.
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C ....
Belden Mfg. Co., 2310B S. Western Ave., Chicago C .. S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. .... B ..
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. ..... C ....
Calido. See Driver Harris Wire Co.
Celatsite. See Acme Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C ....
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. ..... C .. S
Cornish Wire Co., 30 Church, New York, N. Y.. C ....
Corwico. See Cornish Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C ....
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 101 Bradford, Providence, R. I. C ....
Detroit Insulated Wire Co., Detroit, Mich. ..... C ....
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J. .... B ..
Electron. See Bassett Metal Goods Co.
Excellicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.... ....
Gilby Wire Co., Riverside Ave., Newark, N. J.... .. B ..
Goldmark Co., James, 83 Warren, New York.. C ....

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Hope Webbing Co., Providence, R. I. (Braided Wire Tape) ..... C . . . .
Hoskins Mfg. Co., Detroit, Mich. .... R . .
Hudson Wire Co., Ossining, N. Y. ..... C R . .
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C . . S
Indiana Steel & Wire Co., Muncie, Ind. .... S
Inland Wire & Cable Co., Sycamore, Ill. ..... C . . .
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C . . .
Monarch Elec. & Wire Co., 622 W. Adams, Chicago C . . S
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 113 Orchard, Newark. . . . R . .
Nehring Electrical Works, De Kalb, Ill. ..... C . . .
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. .... S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. ..... C . . .
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C . . .
Race. See Ross Wire Co.
Roebling's Sons Co., John A., Trenton, N. J. ..... C . . S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C . . .
Ross Wire Co., 69 Bath, Providence, R. I. ..... C . . .
Silcrimp. See Valley Narrow Fabric Co.
Seneca Wire & Mfg. Co., Fostoria, O. .... S
Silchrome. See Alloy Metal Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y. ..... C . . .
Standard Alloy Wire Co., Elizabeth, N. J. .... R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C . . .
Super-Insulated Wire Co., Plymouth, Mass. ..... C . . .
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C . . .

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WIRE DRAWING MACHINES

Drawing and Re-drawing Mill Equipment for Small Wires.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Con..

WIRE, Insulated

KEY

Annunciator, Office, Bell Wire....See A
Asbestos Covered Heater Cord....See H
Asbestos Covered Magnet Wire....See M
Enameled Magnet Wire .....See M
Fixture Wire .....See R
Flexible Reinforced Heavy Duty Cord .....See F
Heater Cord .....See H
Ignition Cable .....See R
Lamp Cord .....See R
Magnet Wire .....See M
Rubber Covered Wire & Cable..See R
Stove Wire .....See H
Telephone Cord .....See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. R . . . . . .
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn.
Framaled Silk, Cotton .... M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Brass Co., 25 Broadway, New York, N. Y. ..... A . . M . .
American Copper Products Corp., 233 Broadway, New York, N. Y. ....
American Electrical Works (Philipsdale), Providence, R. I. .... M
American Enameled Magnet Wire Co., Muskegon, Mich. .... M
American Insulated Wire & Cable Co., 954 W. 21st, Chicago, Ill. .... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. ..... R F . . A T . .
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda. See American Brass Co.
Ansonia Electrical Co., Ansonia, Conn.
Silk, Cotton, Enameled .... A . . M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... R . . . . . .
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill. ..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F . . . . . .
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H . . . .
Bradford, Kyle & Co., Plymouth, Mass. .... M
Cablex. See Collyer Insulated Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... R F H . . . . .
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R . . . . . .
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.

Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Darow Mfg. Co., 101 Bradford, Providence, R. I. ..... R . . . . . .
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T . .
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R . . . . T . .
Diamond Braiding Mills, Chicago Heights R F H . . . . .
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J. ..... R . . H . . . . .
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind. .... M
Durabit. See Tubular Woven.
Duracord. See Tubular Woven.
Durawire. See Tubular Woven.
Durn. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R . . . . . .
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. .... F . . . . . .
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. ..... T . .
General Asbestos & Rubber Co., Charleston, S. C. .... H . . . . .
General Elec. Co., Bridgeport, Conn.... R F H . . . M
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet ..... A . . M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R . . . . . T . .
Grimshaw. See New York Ins.
Habirshaw Cable & Wire Corp., 10 E. 43rd, New York, N. Y. ..... R . . . . . .
Hatfield Rubber Wks., Inc., Hillside, N. J. R . . H . . . . .
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa. R F . . A . . . . .
Hercules Powder Co., Wilmington, Del. . . . . A . . M
Holyoke Co., 621 Broadway, New York.. R . . . . A . . M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H . . . . .
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R . . . . . .
Kilo. Co., 2 E. 23d, New York. .... T M
Koolie, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. .... T . .
Liberty. See Nat. Metal Molding.
Lowell Insulated Wire Co., Lowell, Mass. R F H . . . . .
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass. ..... R . . . . . T . .
Maring Wire Co., Muskegon, Mich. Cotton, Silk, Enameled .... M
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T . .
Massachusetts Elec. Mfg. Co., West Lynn, Mass. .... M
Monarch Elec. & Wire Co., 622 W. Adams, Chicago, Ill. .... A . . .
Montgomery Co., J. R., Windsor Locks, Conn. .... T . .
National India Rubber. See U. S.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. ..... R F H A T M
N. E. See Goldmark Co., James.
New England Wire Co., Westfield, Mass.. R . . H . . T . .
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R . . . . . .
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co.
Okonite Co., Passaic, N. J. ..... R . . . . . .
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O. ..... R F . . . . . .
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Parafiex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. .... H A T . .
Phillips Wire Co., Pawtucket, R. I. ..... R . . . . . .
Providence Insulated Wire Co., Providence, R. I. ..... R F H A . . . .
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn. ..... R . . H . . T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Rome, N. Y. .... M
Rome Wire Co., Rome, N. Y. ..... R F H . . T M
Ross Wire Co., 69 Bath, Providence, R. I.. R . . . . . .
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill. .... T . .
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H . . . . .
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R . . . . . .
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F . . . . . .
Shield. See Ansonia Elec'l Co.
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. . . . . H . . . . .
Standard Insulated Wire Co., Westfield, Mass. ..... R . . H . . . . .
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T . .
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R . . . . . .
Strand & Sweet Mfg. Co., Winsted, Conn. . . . . M
Super-Insulated Wire Co., Plymouth, Mass. . . . . M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.

Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn. ..... R . . . . . .
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F . . . . . .
United States Rubber Co., 1790 Broadway, New York, N. Y. ..... R . . H A T . .
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. .... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H . . T . .
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y. ..... R . . H . . . M

WIRE, Steel Flat

Steel Coating for Armored Conductor.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines .....See A
Braiding Machines .....See B
Bunching Machines .....See S
Covering Machines .....See I
Insulating Machines .....See I
Insulation Straining Machines.....See I
Measuring Machines .....See M
Park Cabling Machines.....See A
Saturating Tanks .....See F
Spooling Machines .....See U
Stranding Machines .....See S
Tinning Tanks .....See F
Winding Reels .....See U

Adamson Machine Co., Akron, Ohio.. I A . . . . . .
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A . . . . S U F
Breguet. See American Insulating Machy.
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. .... M . . U . .
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I . . . . . U . .
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. . . . . M . . U . .
Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U . .
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I . . . . . .
Sleeper & Hartley, Inc., Worcester, Mass. .... A . . . . S U
Terkelson Machine Co., 326 A St., Boston, Mass. .... M . . . . .
Textile Machine Works, Reading, Pa. . . . . B . . . . . .
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn. ..... . A . . . . U F
Utility Mfg. Co., Cudahy, Wis. ..... I . . . . . .
Wardwell Braiding Machine Co., Central Falls, R. I. .... B . . . . . .
Wire Machinery Corp. of Am., New Haven, Conn. .... M S U . .
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.
Shuster Co., F. B., New Haven, Conn.

WIRE TAPING MACHINES. See Taping Machines, Wire.
WIRE VULCANIZING MACHINES. See Vulcanizers Wire Insulation.

WIRE WRAPPING MACHINES

Terkelson Machine Co., 326 A St., Boston, Mass.
WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.
WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

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American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville, Inc., New York, N. Y. (Asbestos.)
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

ZINCS AND COPPERS, Battery

Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd. Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Horse Head. See New Jersey Zinc Co.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co. 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Mattiessen & Hegeles Zinc Co., La Salle, Ill.
New Jersey Zinc Co., 160 Front, New York, N. Y.

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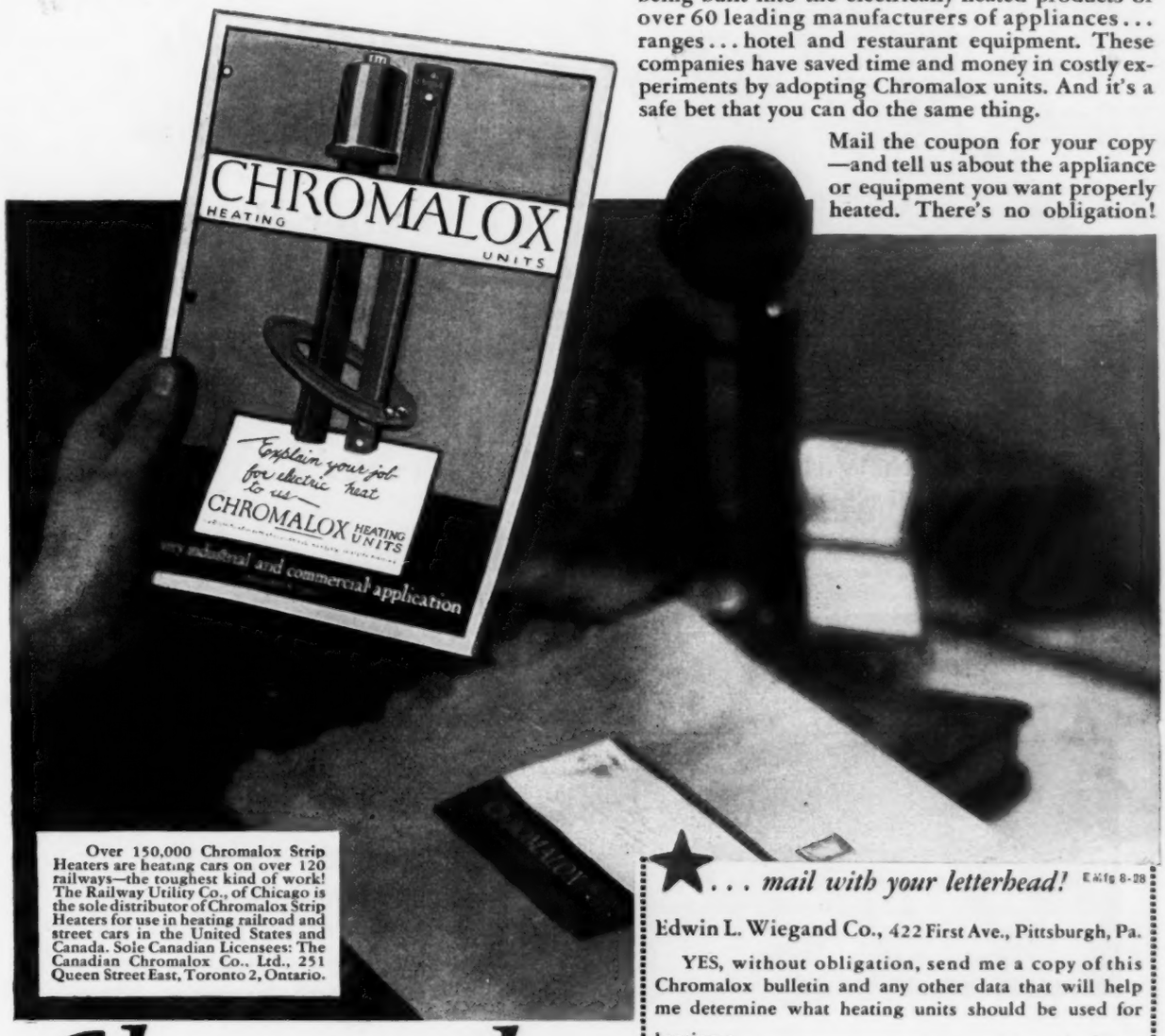
Then you'll want a copy of this bulletin. In it are priced and pictured the many sizes of heating units being built into the electrically heated products of over 60 leading manufacturers of appliances... ranges... hotel and restaurant equipment. These companies have saved time and money in costly experiments by adopting Chromalox units. And it's a safe bet that you can do the same thing.

Mail the coupon for your copy —and tell us about the appliance or equipment you want properly heated. There's no obligation!



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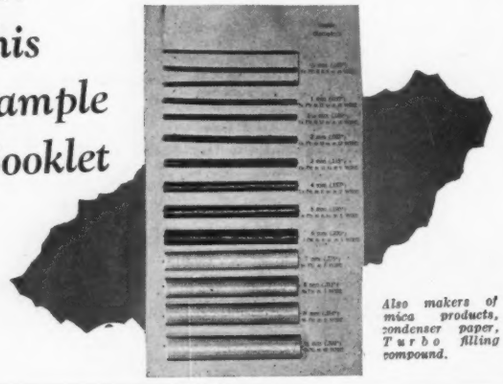

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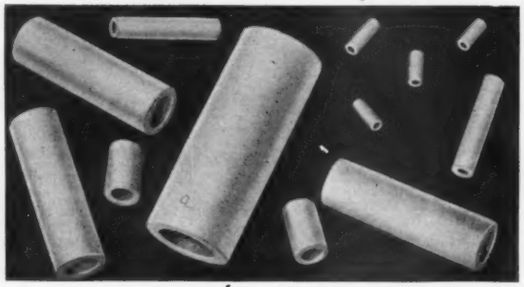

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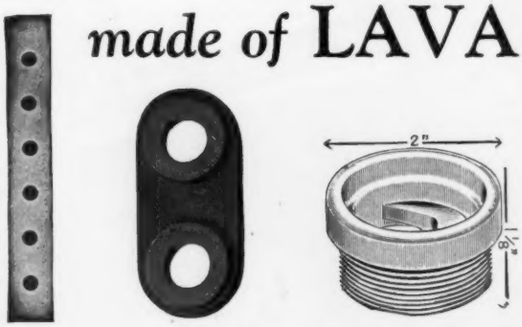

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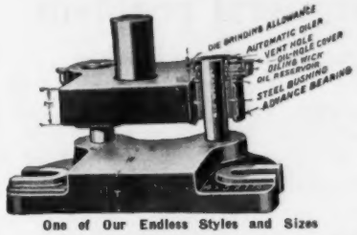

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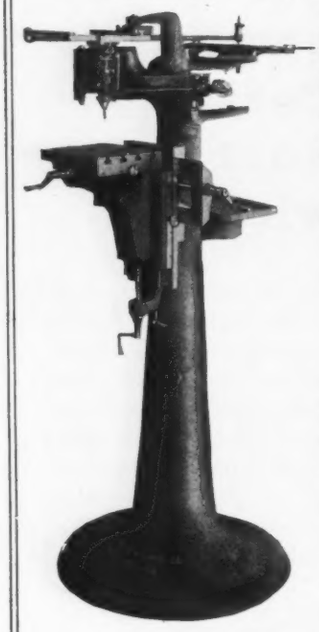

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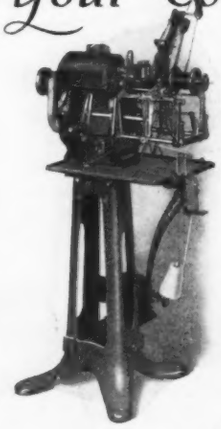

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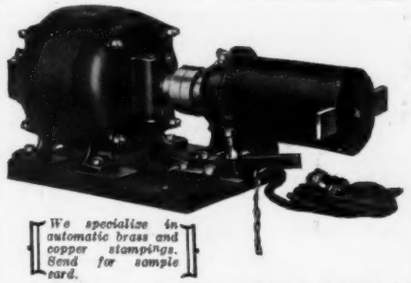

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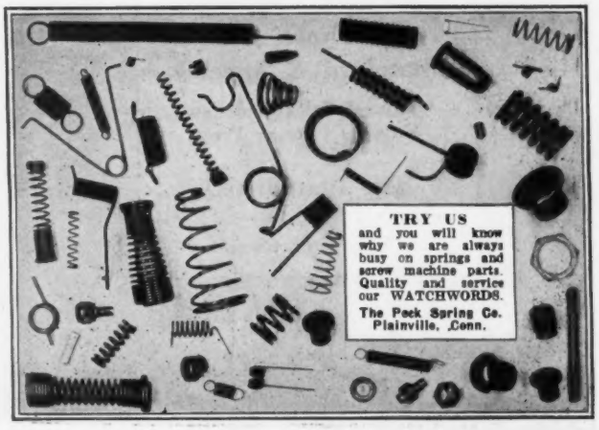

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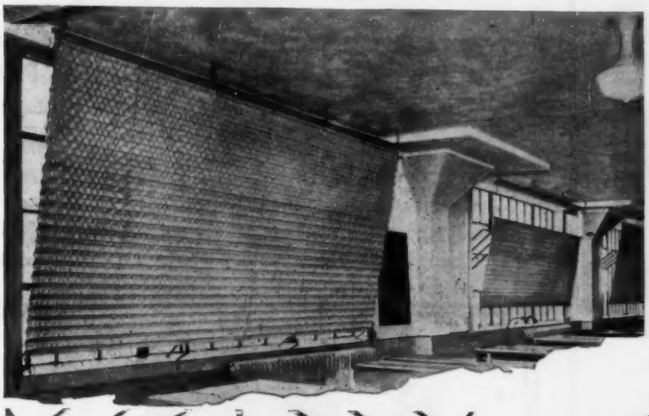

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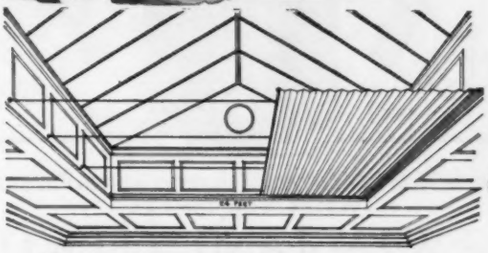

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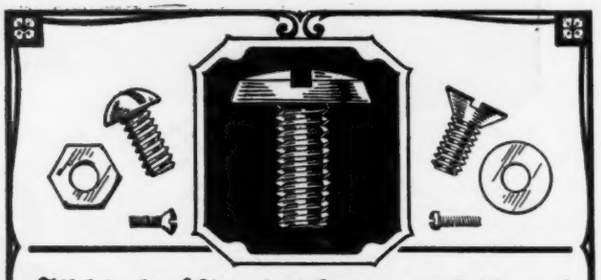

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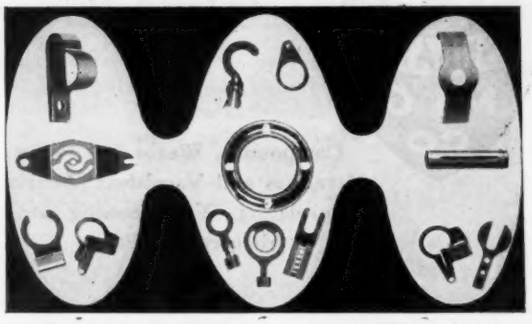

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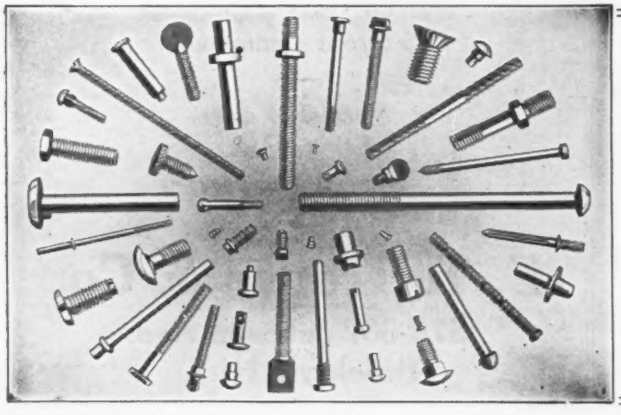

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"Packard" Vacuum Cleaner
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"Flint" Waffle Iron

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Printing Crafts Bldg., 461 Eighth Ave.,
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WELL DONE
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ON

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The Baltimore Brass Company
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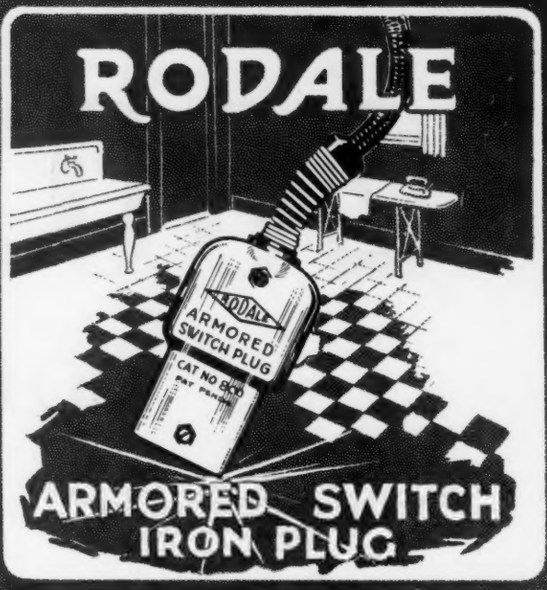

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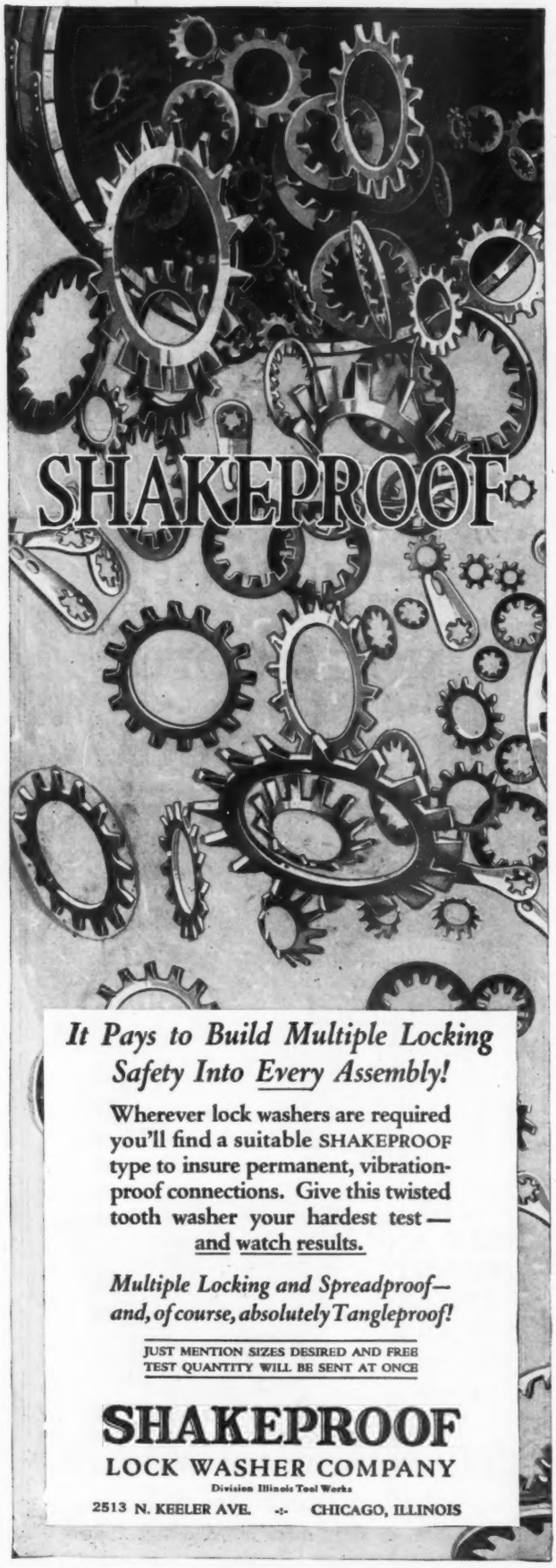
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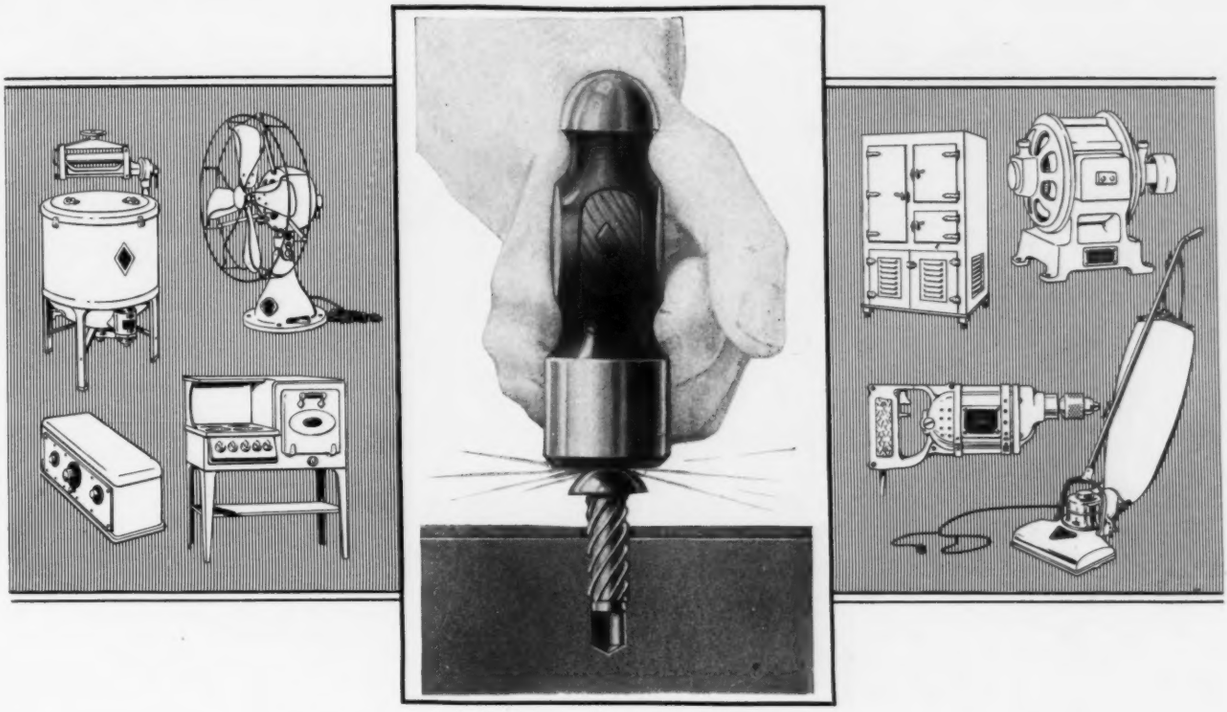

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the Screw you drive with a hammer is cutting costs—speeding production

ON giant generators as on fractional horsepower motors—on vacuum cleaners, washing machines, radios—on electrical products of almost every description—Parker-Kalon Hardened Metallic Drive Screws play an important part in cutting costs and speeding production. For wherever there is a permanent fastening to be made to iron, brass or aluminum castings, steel, Bakelite, etc., these unique Screws prove their time- and labor-saving worth.

How they are used

Making a fastening with Drive Screws requires but two simple operations—drilling holes and driving in the Screws. Their hardened thread cuts into the material as they are hammered in—and once in, these Screws are there to stay. Even severe vibration cannot loosen them.

How they save

By cutting their own thread, Drive Screws eliminate tapping with its frequent tap breakage and heavy investment in tapping machinery and even when used in place of rivets, escutcheon pins, etc., they often effect savings of from 50 to 75% of assembly costs.

Where they save

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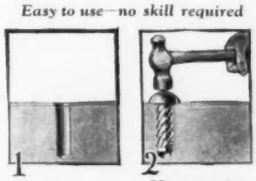
Give them a trial

Test them out on some of your own assemblies—see for yourself what they will enable you to save. Just tell us what you want to fasten and we will send suitable samples. No charge—no obligation.

Easy to use—no skill required



Drill a hole — Hammer in the screw

Parker-Kalon
TRADE MARK
Hardened Metallic
REG. U.S. PAT. OFF.
Drive Screws

PATENTED JAN. 29, 1924 - No. 1482151
OTHERS PENDING

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190-204 Varick St., New York

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Address .....

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